

# Basic Computing

The TRS-80 User Journal

CP/M

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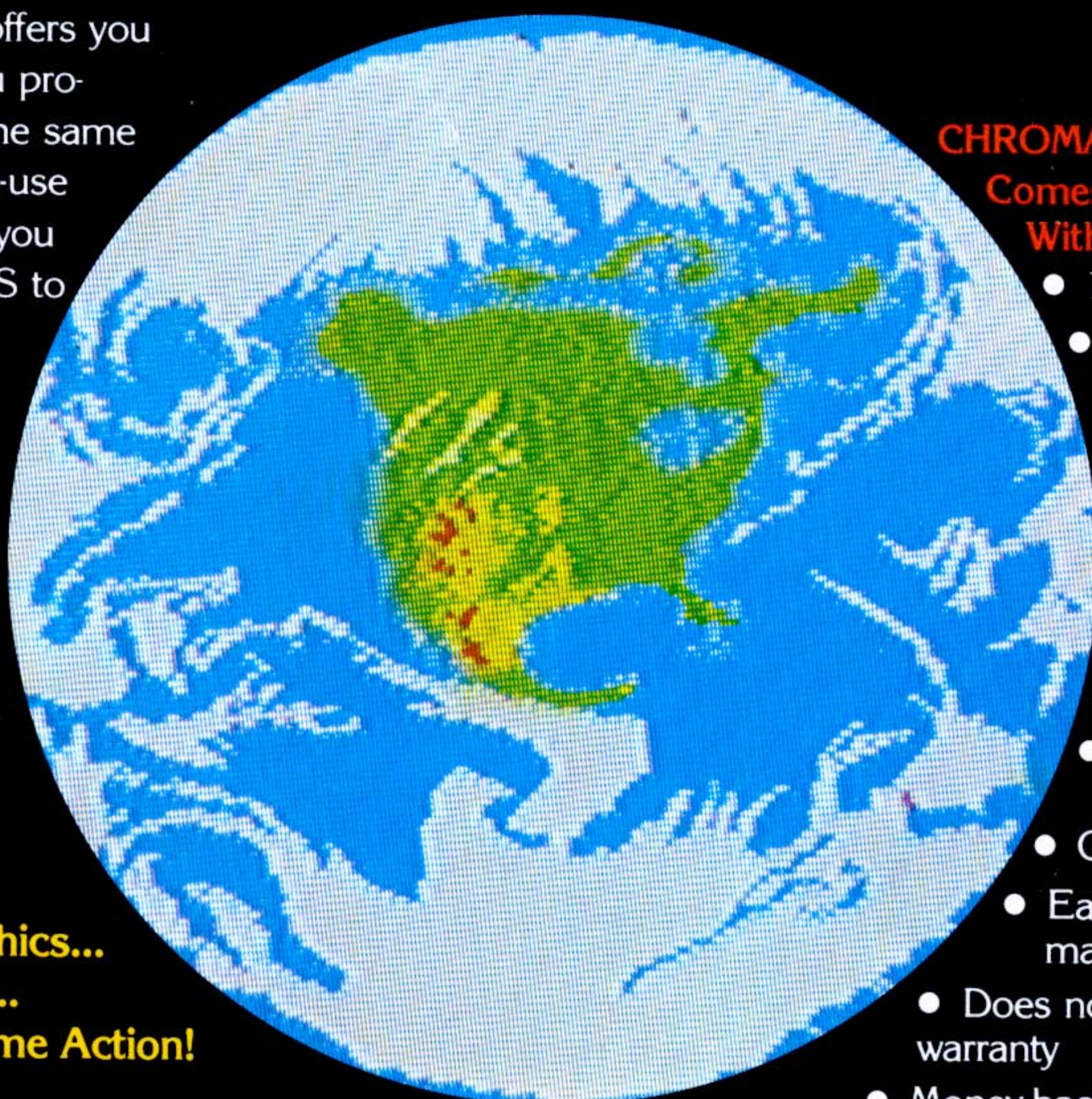
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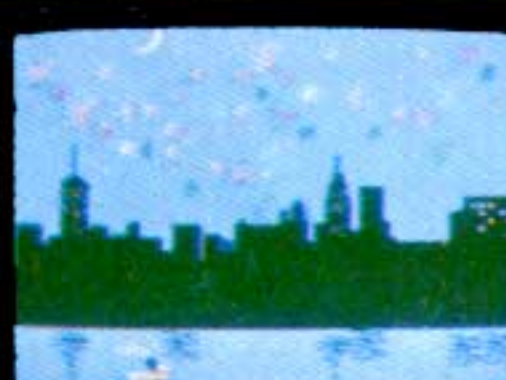
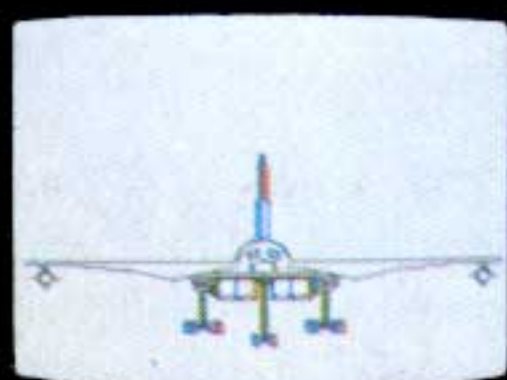
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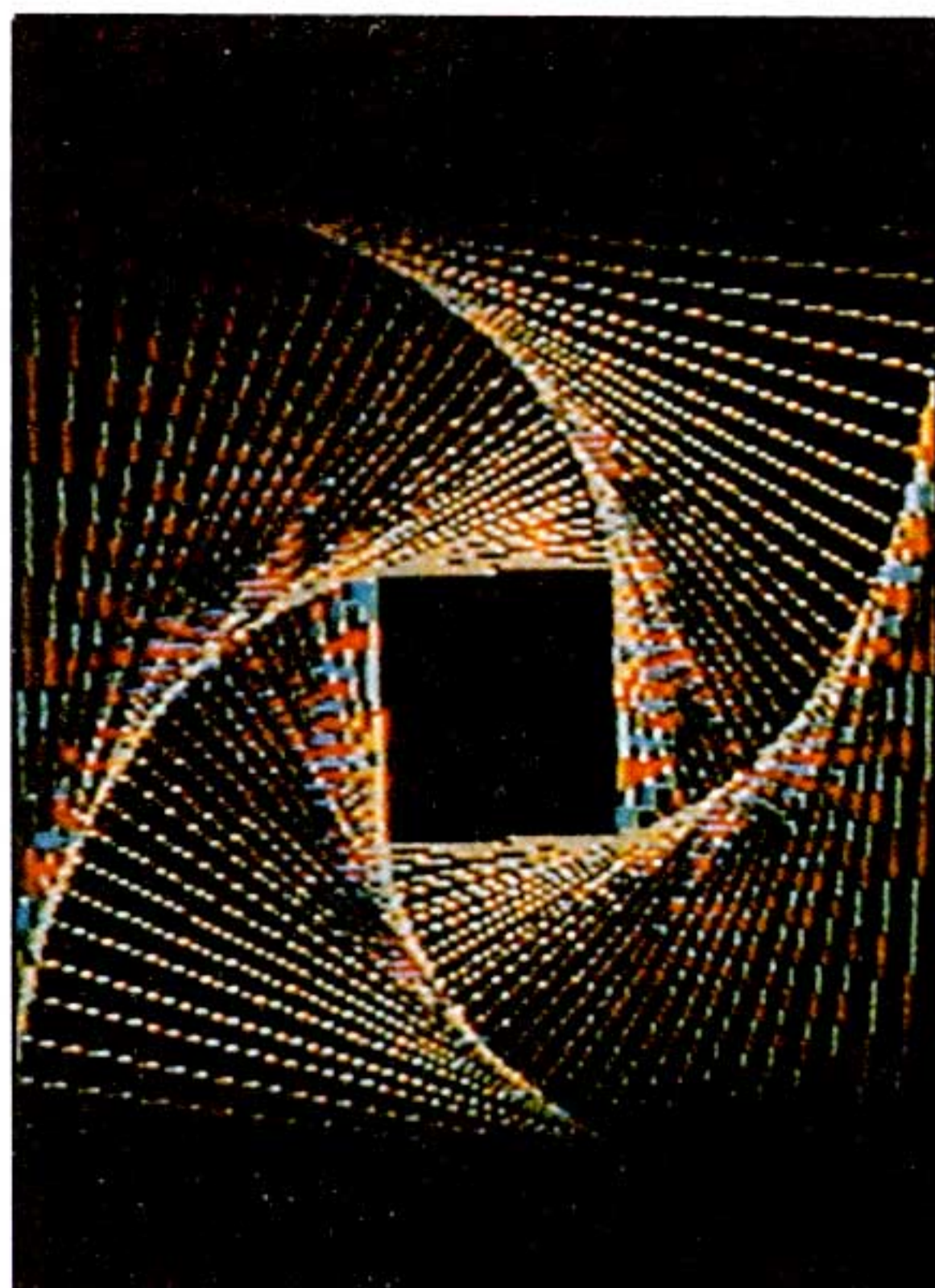
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**ISSN Publication #0199-1035.** Basic Computing is published monthly by 80-Northwest Publishing, Inc., 3838 S. Warner St., Tacoma WA 98409-4698. Printed in the United States of America.

**POSTMASTER:** Please send change of address form 3579 to Basic Computing, 5615 West Cermak Road, Cicero, Illinois 60650. **Second Class postage PAID at Tacoma, WA and additional entry points.**



**Our cover art** is the work of Randy "Tarkas" Hoar. It is an artist's rendition of the program on page 26 ("Four bugs on a rotating square"), written by Dr. Henry Sonneborn, III. Above is a photograph of the actual screen display after running the program on the Color Computer.

# Basic Computing

## The TRS-80 User Journal

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# Editorial

Cameron C. Brown

We are being bombarded by advertising based upon fear of failure, fantasy, and puff numbers.

"They've changed the prices and the board meeting is in two hours! What can we do?" That scenario is being played over and over again on television and the answer is, obviously, "Run out and buy our computer." Horse feathers!

The picture of a middle-level executive getting a pat on the back from the president of the company for the up-to-the-minute reports via a four-color printer/plotter, spreadsheet program, and word processor is pretty sickening. If any of you know a company which pays and promotes on such a basis please let me know. I can think of a number of people who could live up to the motto "Have Profile—will travel. Pie charts extra."

The key is problem solving and a computer, no matter how good the software is, can't do it for you. It takes training and experience. There are many fine data base manager programs, but if you don't design and include important information they can't help you.

Then there is the television advertisement by Commodore where a young man is sent back from college after failing his freshman year because he didn't have computer experience. Who are they trying to kid? Ask any computer science major and you will find that there is little relationship between microcomputers and their studies. And who would believe that it was the art

department that sent him packing?

Even our own industry, publishing, is falling into the trap. We have been growing steadily and consistently since 1978. In this year alone we have almost tripled our total circulation. That is good, strong growth. It reflects what has been happening in the whole microcomputer industry. Yet, notices cross my desk every day of new magazines claiming thousands of readers, even though an issue has yet to be printed. The notices are okay with me. What bothers me is that people believe them.

The puffery has affected everyone. In a recent notice to advertisers, we told them of our new circulation numbers. Two people told us they saw it, but didn't believe it. Why should they, when every day they read about 100,000 this and a "guaranteed" 300,000 that. (Perhaps they will after our BPA audit is completed.) I bet if Tandy comes out with another new machine in December, at least three publishers will be claiming in *November* that they have thousands of readers for a magazine devoted to that model.

One last point that gnaws at me: contrary to what another magazine says, we are the oldest TRS-80 magazine. Our first issue was in September, 1978 and last month's issue marked the beginning of our sixth year. My thanks to all of you who have helped make it so successful and thanks for letting me blow off a little steam.

## Basic Computing

The TRS-80 User Journal

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# Letters to the editor

Cameron C. Brown

I would like to congratulate you on your editorial in the August issue. I also received the same flyer and found it hard to justify the money. Especially if one were to take that amount and go to a good bookstore and buy all the computer books on the two subjects. They would then have more than just "insights".

This brings up a subject I would like to address. Is it necessary for CP/M programs to cost up to five times as much as the same type of program in BASIC or machine language operating under a "regular" DOS for the TRS-80? What makes dBase II worth \$500 and Maxi Manager worth only \$150 when both do almost the same thing? And Maxi Manager is easier to use.

I have to use dBase II at work on our IBM-PC. I have Maxi Manager at home for my TRS-80 Model III.

With DOSPLUS 3.5 on my "toy-80", I have all the power and benefits of IBM's DOS 1.0, and DOSPLUS has all the bugs removed!

I don't mean to ramble on, but some people get wrapped around the axle with brand names and then wonder why some of us just keep progressing beyond the limits they have reached.

My subscription doesn't run out until 1986, so I won't renew for a few months yet. Thanks for a comprehensive publication for the TRS-80. I don't care what the "big guys" say, I still like my Model III.

**Robert Kyle**  
Minneapolis, MN

Your editorial on outrageously expensive seminars was very enjoyable and raised some questions I have had for some time. I constantly get announcements and invitations to such things in the whole realm of computers, communications, switching systems, etc. I have never had the kind of money available to accept them but have noticed that they all seem to be geared toward the person who would be attending at his employer's expense and they are located in cities that have a degree of tourist attraction. I often wondered if they were non-taxable fringe benefits that employers dealt out to the faithful few.

Whenever a whole field booms as fast as the microcomputer field has, there are inevitably going to be a few charlatans who are going to try for the fast buck. Some sell worthless software, others write worthless books, and others tout junk hardware peripherals. I have found the best way to be an informed buyer is to keep as up-to-date as possible by reading the time-proven magazines.

Even in this area there are some problems. I have noticed that when a magazine rates either hardware or software on, for example, a one to ten scale, 90 percent of the items end up with an eight or above rating. If the item is also one of their

advertisers, a nine or above is just about a sure thing. Let's face it, we all know there is junk out there. Where are the reviews that tell us to keep our money in our pockets?

I have seen magazines run reviews with an ad for the item on the facing page. Does the publisher think his readers are such clods as to not wonder about any degree of bias? A year or so ago, one magazine made a statement about reviewing so many products that they had space to print only those they thought well of. (If we home computerists really fell for that line, we must be gullible!)

My remarks are obviously aimed at the whole range of microcomputer magazines. Some come out with higher marks than others, and the number and types of reviews differ widely. *Basic Computing* comes out on the high end of the scale. When you come across trash in the marketplace, please let us know about it from in your magazine, not through the trauma of buying junk.

**Howard S. Gilman, Jr.**  
College Park, MD

*My thanks to both of you regarding the August editorial. The questions you asked have no easy answers. I find much of the TRS-80 material to be reasonably priced and many of the items are well debugged. Yet advertisers, software and hardware developers quickly fall in love with every new kid on the block. Whenever I go looking for "regular" DOS material, I have to put up with MS-DOS, CP/M, and others. I keep getting told that there is a "world of software" out there on CP/M. In fact, we look at just that question in this issue.*

*Have you seen the size of PC World or other IBM magazines and the prices that are being asked? Perhaps we are the lucky ones — fair prices for well-tested products. If all were as smart as we, and the TRS-80 became the "hottest" item, our prices would probably skyrocket as the quality plummeted. And I certainly don't want to have to edit*

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Use your own words. Write as much as is necessary to tell the story but stay to the point. Most submissions run about five to ten typewritten pages in length, excluding any programs. Avoid jargon or technical phrases and don't be afraid to define the terms as you go. Many of our readers are new to computing and are probably not as proficient as you are.

Please submit typed, double spaced, text that is in upper and lower case. Include pictures or figures when appropriate. Be sure that all drawings are carefully done, with black ink on white paper. We prefer to shoot pictures from your originals rather than use an artist. Pictures can be in color or black and white. Our readers might like to know something about you, so include a brief autobiographical paragraph if you wish.

Programs that accompany articles must be submitted on cassette tape or diskette. Clearly label the media with your name, the program's name, and the type of system it runs on. Include a paper listing as well. Programs that can run on more than one model of TRS-80 are especially desirable. Your chances of acceptance increase greatly if it can appeal to more readers. Material that is extremely hardware or software dependent has a lower chance of being accepted.

All references to marketed software or hardware should include the manufacturer's name, address, and current price. If you are sending in a review, be sure to tell the version number of the material under evaluation. Reviews are not sent to the company for comment prior to publication.

You will receive a notice that your material has arrived. If the material is accepted, our check will be included. We pay on acceptance, not publication. We are purchasing all publication rights to the article and associated programs. We do not guarantee publication of the material. Our payment is not on a per page or per word basis. Most authors can expect \$100 to \$200 per feature article and \$35 to \$50 for reviews. After publication, the original material is returned to you. For rejected articles, all material is returned.

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## How To Enter Our Listings

Our program listings come directly from the submissions of our authors. We do not edit them at all (that's why you sometimes see spelling errors in them). We run all submissions and make sure that they do work.

To enter one of the listings given make sure you have the type of computer specified and all necessary programs, operating systems, or hardware that the program uses. Type in the program exactly as it appears in the magazine. Be extra careful so you do not confuse 0 (zero) with O or 1 (one) with I or L. Save the program to tape or disk **before** running it. On long programs it is wise to save it as you go along, thus protecting yourself from having to re-enter the whole program if the lights go out.

Here are some tips to help you catch errors that you may have made in typing. If you get an out of data error, the problem lies in the DATA statements, rarely in the READ line that the computer refers to. Check all DATA lines to see that they are correct and that no commas or values are missing. It might be useful to print each variable after it is read, that way you can follow the computer as it goes through the data. Just insert a :PRINT variable right after the READ variable command.

Many of our authors use a linefeed, or downarrow, in their programs. If you see lines of code that have many blank spaces and then they begin again on the next line with more code, a linefeed was used. Even if you don't use them, the program will run but the video display may be messed up.

You will find the TRON command helpful in following the program's logic. By turning the trace command on, TRON, you can see what lines are being executed by the program. It is very useful in catching GOTO or GOSUB errors and incorrect references to linenumbers. Don't worry about video formatting when the trace is on, it will be quite messy.

If you find yourself getting TM or type mismatch errors, check carefully the use of the \$ symbol. Also look at the beginning of the program to see if you correctly entered the DEFINT or DEFSTR statements.

Function call errors usually occur when a variable has a value that is not allowed. Check all variables that are being used by the function, one of them probably has the wrong value.

If after all that, you can't get it to run, send us a paper listing of your program, what systems you are running it on, and carefully document the error you are getting. We will do what we can to find the flaw. It is very difficult for us to try to help you debug errors over the phone. Check Letters and Notes, etc. in the next few issues for updates or conversions. Many times a reader will tell how to embellish a previously published program.

## Back Issues

### May/June 1979

String packing techniques  
Determine functions of the brain  
How to win Nim-type games

### July/Aug 1979

Create fast graphics  
Renew lost programs  
No-hardware lowercase mod.

### Nov/Dec 1979

Function grapher/root finder  
Home heat loss program  
Restoring killed disk files

### May/June 1980

Telecommunications with the TRS-80  
BASIC game program technique  
Produce sound with BASIC programs

### Nov/Dec 1980

Simple payroll program  
Digital plotter interface  
Produce keyboard typeahead

### May/June 1981

Line packing techniques  
How to use "PRINT USING"  
Animation and the TRS-80

### July/Aug 1981

Descending lower case for Model I  
Student timetable program

Easy tape loading for Model I

### Sep/Oct 1981

Keyword search database program  
Compute a retail installment contract  
The vertical mill: a 3-D plotter?

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### Apr 1982

Microcomputers and investments

### May 1982

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Games issue

### Jul 1982

The TRS-80 in law offices

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## Letters

any issue that weighs in at almost three pounds.

We print what our reviewers have to say. If it is negative, it runs. If it is positive, it runs. The company sees the review for the first time when it is in print, not a pre-release. The difficulty is in deciding which review to run. Editorial space is always at a premium. It is my opinion that readers need to be warned about a \$150 program that does not work. The need to report on a poor \$14.95 game is not as great.

We do not use a number system in our reviews for many reasons. Besides the reason you have noted, readers tend to overlook the article if a little summary box is used. Summaries, by their nature, leave out information. Categories, by their nature, generalize and do not address the uniqueness of the item being reviewed. So, in *Basic Computing*, you will have to read the review. That's fair to everyone involved.

When we run an ad next to a review or article, it is for your (as well as the advertiser's) benefit. Sometimes ads carry information not in the review and vice versa. Sometimes advertisers would like reprints. A lay-out that includes their ad is just a courtesy. Is it a collusion or a compromise on facts? No. --Ed.

I took a copy of the article by Robert Grater, ROM Remedies, June 1983, to my computer club. Another member told me that you really don't have to take the ROM pak apart, just push back the little plastic cover to expose the pins and put Scotch tape on the two pins which were indicated in the photo on page 42.

This also lets you convert back to standard operation by simply taking off the tape. I've since taped

the pins on my Color Scribes ROM pak and it works fine. I have trouble remembering EXEC 49152, so I taped that on the side of the cartridge. I've been using it for some time now with no problem.

**Doug McLaughlin**  
Oxnard, CA

Heartfelt thanks to Rik Karlsson for Pagelist, August 1983. Many of us had wanted this for years.

A few comments on the minimal changes that seem to be necessary for Model III users. The HIMEM recorder on the Model III is at 4411H, rather than 4049H as it is on the Model I.

The call to the ROM printer driver at 03C2H (Model III) in line 1880 clobbers HL and BC. The similar call at 1820 does not do so because it only handles carriage returns, which go straight through to the printer. Other characters, including the ASCII 20H's that 1880 takes care of, have to pass through the translator and this uses HL. I bracketed line 1880 with PUSH HL, PUSH BC, and POP BC, POP HL.

It should be possible to use the character and line counters in the printer DCB (line counter 4029H, character counter 302AH), which would lead to a very minor simplification by eliminating the separate counters, TEMP and COUNT.

I normally use fanfold paper and my aim was to get rid of the inevitable line that sits exactly on the fold and is completely destroyed when the sheets are separated. So, I substituted a form-feed for Mr. Karlsson's HOLD action. As would be expected, Pagelist works just as well on ETDASM as with BASIC. Thank you.

**Richard H. Booth**  
Asheville, NC

Something is wrong with my latest issue of *80 NW, 80 US, Basic Computing*. It arrived within the week of the cover date, it had a correction from the *last* issue, and it had up-to-date information as well as interesting articles, programs and news.

How are you going to get as big as *BYTE* if you don't have a seven-month lead time for columns and articles for products that are not available? Keep it up!

**Richard Riley**  
Augusta, ME

*Don't worry, we'll try not to let it happen again. --Ed.*

I was pleased to see the review of Bill Holman's Accounts Receivable program by Helen Dalton in your August issue. We have been using this package for about a year with excellent results.

The review points out that there is no provision to sort accounts alphabetically, which is correct. Bill Holman makes reference to a solution to this which we have carried a little further and found to work fine. Before we started entering accounts, we spent some time with our old ledger cards breaking the alphabet into groups which included no more than ten accounts. Each of these groups were then assigned a three-digit number which became the first three digits of the account number. We ended up with about 315 groups. The last three digits of the account number were assigned in sequence as needed. The result is that our account number listing is very close to an alphabetical listing since no account would be more than ten places out of order. We would be happy to share our groupings with other users if they write and ask.

Two other points should be mentioned about this program. It is very easy to install. My bookkeeper, with only three months of experience with the computer and no programming background, had no difficulty getting it running. Secondly, Bill Holman has provided outstanding support. He answers the phone himself and has the answer to that stupid question right at hand. On the few occasions where

### Mr. Booth's changes to Pagelist:

2020		JR	Z, NXPG	
2030		RET		
2040	NXPG	PUSH	HL	; ONLY GET CAUGHT ONCE!
2050		PUSH	BC	
2060		LD	C, 0CH	; FORM FEED
2070		CALL	03C2H	; MOD III DRIVER
2080		POP	BC	
2085		POP	HL	
2090		LD	(HL), 0	; RESET LINE CTR
2100		RET		



a phone answer wouldn't do, a written answer was in the mail the same day. It's a shame everyone doesn't provide the level of support Bill does.

**James K. Dresser**  
**Dresser Products, Inc.**  
 708 East Avenue  
 West Warwick, RI 02893

*We were aware of the subdivision technique, but our problem was that the account numbers we used were already pre-assigned. Rather than changing our ledger and budget programs to meet the new numbers, we kept them. Hence, the difficulty in obtaining alphabetized or even pseudo-alphabetized listings. --Ed.*

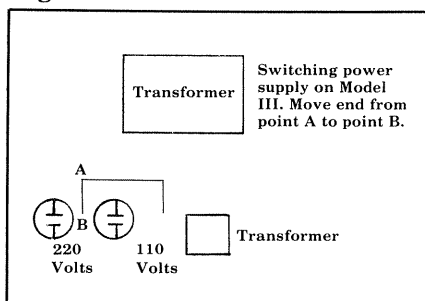
Regarding the letter from P. R. Berry in the May, 1983 issue: There is no problem in modifying the Model III from 110 volts to 220 volts, and vice versa. The Model III has two transformers — one large and a smaller one that is switchable. Near the smaller transformer is a pluggable wire that runs near two big electrolytic capacitors. The plug near the transformer is for 110 volts, and there is an empty plug near the capacitors for 220 volts. All you have to do is remove the end that is plugged near the transformer to the plug near the capacitors. The other end of the wire, that is also located near the capacitors, is not moved, see Figure 1. Note that a Model III with disks has two power supplies and you have to do this twice.

On a Model I, you have to purchase replacement transformers for the machine. I have found that there are no problems due to the difference in 50- or 60-cycles.

**Hanspeter Schmid**  
 Leimen, W. Germany

*Thanks for the information. One small note to add: The cycle difference will affect real-time clocks that you may be using.*

**Figure 1**



Refer to advertiser index for reader service number

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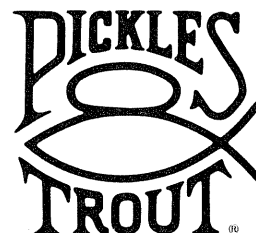
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# Notes, etc.

Cameron C. Brown

## CP/M: Control Program for Microcomputers

We chose CP/M as our October theme in March. At that time, we knew about the Model 4 and its promise of CP/M 3.0 (also called CP/M Plus). The availability of a new operating system on a new machine made it a natural. As happens with all well laid plans, something "oft gang aglay." We were going to get a review copy of Model 4 CP/M in June, then July, and it's now the middle of August. Model 4 CP/M is still not on the shelves but, as the ads say, it is coming soon to a theatre near you. Not to be deterred, we did find a wealth of information for you.

From the TRS-80 viewpoint, the CP/M world is quite fragmented. Model I and III owners need to do a hardware retrofit before they can get started. Even then they have to be careful about non-standard disk formats, memory limits (48K Model I, 64K Model III), and video capability. Model 16 owners have to obtain a Model 16/Model II mode CP/M 2.2 to install their CP/M 68K. Model 4 owners can look forward to a CP/M, but it may only be a Radio Shack release. No company we spoke to said that they planned to release a Model 4 version of CP/M if Radio Shack was going to sell it. The Model II/12 owners are the lucky ones. Their disk format is standard and many vendors have CP/M available right now.

I still have to be convinced. CP/M is not my choice for an operating system. There are numerous DOSs that have more flexibility, more capability, and more tolerance for the new user. CP/M's important because "everyone" uses it. The same could be said for Kleenex.

12 Basic Computing

## SuperScripts

Right after buying a review of SuperScripts 1.0, version 1.1 came out. So we scrapped the first one and ran a review of 1.1 in our July issue. Well, Tim Bowman has called to let us know that 1.1 "isn't bullet proof" and that version 1.2 is now available. Model III owners should contact their local stores for updates.

## Model 4 program conversion

Tim also wrote us describing his technique for moving Model I/III programs over to TRSDOS 6.0. In the Model 4 manual it indicates that Model III application files will not transfer to the Model 4. Follow the steps below and most BASIC programs saved under TRSDOS 1.3 (Model III) will convert and run on TRSDOS 6.0 (Model 4).

1. In the Model III operating mode, save the Model III program in ASCII format.
2. Load the file into your word processor, such as Scripsit.
3. Using the global change command, change all of the BASIC commands such as GOTO, IF, etc., to insert a blank space after each command.
4. Eliminate any ROM calls.
5. Save the file back out in ASCII format.
6. Enter the Model 4 operating mode.
7. Use the CONV command in TRSDOS 6.0 to move the file from the Model III diskette (in drive 1) to the Model 4 diskette (in drive 0).
8. Finish debugging the program for Model 4 operation. The most time-consuming task will probably be reformatting the PRINT @ statements.

## Corrections and Updates

Mr. Robert Pollock wrote to tell us that his article, Typos, June 1983 needs a change in line 65436. It should read:

```
65426 OC=OA+UA: UH=0:
GOSUB65452: UB=OB: UA=UA+
1: IF UF=3 AND UB<>58 AND
UB<>0 OR UC=1 AND UB<>0
AND UB<>34 GOTO 65436. . .
```

Guitar Seminar, July 1983, by Lynard Barnes needs two line corrections. To line 490, add (at the end of the line) the code: ELSE IF D\$(1)="" AND Q\$(1)="", GOTO 520 and line 230 should be changed to read: IF C1=""', GOTO 240 ELSE C1=""

In August we printed modifications to the article Electronic Watchdog, June, 1983. The code for Model III Disk users was in error (ouch!). The IF . . . THEN statement for line 40 must read "IF S<>108 AND S<>109 THEN 60 ELSE 40." The code we gave would lock the alarm in the on position. I think I'll see if I can get an electronic watchdog for this column.

## Puzzler

In January, I added this little section to Notes, etc. for the fun of it. Your input has been excellent but a slight explanation is in order. Puzzler is for fun. Its aim is to get you thinking about methods, difficulties and techniques. I don't purport to be an expert or even the best judge of the answers. Each month I learn something new, see a new way to look at a problem, and am impressed with the creativity shown in the submissions. If you just try to solve the puzzle, you *are* a winner.

This month, we invite you to test a hypothesis that was first stated by



Stanislav Ulam of the University of Colorado. He said that any positive integer would always converge to one if treated as follows: If it is odd, multiply it by three and add one; if it is even, divide it by two. This procedure is then applied to the result of each calculation. For example, starting with eleven produces a sequence of fifteen numbers: 11 34 17 52 26 13 40 20 10 5 16 8 4 2 1. Test the hypothesis on the integers 2 to 500, inclusive, and find the longest sequence that is generated. Tell us the integer(s) that gave it and the length you obtained. Send your answer on a postcard to October Puzzler, *Basic Computing*, 3838 So. Warner, Tacoma, WA 98409. The winner receives a free six month subscription, or extension, to *Basic Computing*.

### Color Computer Week

The Honorable Thomas Bradley, Mayor of Los Angeles, CA has officially designated November 1 through 7, 1983 as Color Computer week for the city. It coincides with ColorExpo '83 being held at the Pasadena Center Conference Building. I wonder which city will have the first MC-10 week?

### In this issue

We are covering the use of the CP/M operating system on the Models I/III, and II/12/16. Be sure to take a look at the articles by Harry Avant, Terry Dettmann and Jim Bombardier even if they talk about models you don't own. Each article contains information that you can use.

Check out your fog index with our Gobbledegook program or watch Four Bugs on a Rotating Square. Tom Quindry takes you through TRSDOS patches with BASIC bits and Mark Renne makes input and output all so clear in Computer ease. Model II owners will find the disassembler a joy to use.

Some of our regular columnists took a vacation this month, but you can count on seeing Basically BASIC and In The Chips next time. Captain 80 has moved on to other things. Our thanks to Mr. Bob Liddil for his contributions and we wish him well.

Our wishes to you for a happy Halloween. We hope there are no goblins in here.

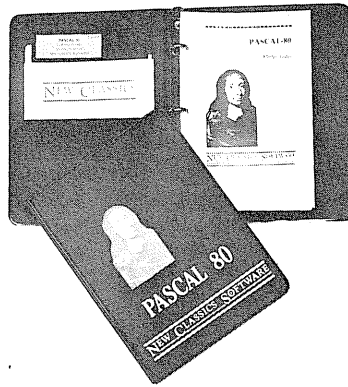
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# The hows and whys of Model I/III CP/M

## Models I/III

Harry Avant, La Crescenta, Ca

During the past three or four years, CP/M has become one of the standard operating systems available for microcomputers. Quite often, CP/M is referred to as *the standard* because it has been implemented on so many different brands of microcomputers. It is possible to modify a Model I or Model III so that CP/M may be used on these machines.

The first question that should be asked in considering CP/M for a Model I or Model III is, "Why bother?" TRSDOS and the alternate operating systems such as LDOS, NEWDOS, and DOSPLUS are all quite capable operating systems and none of these require hardware modification. CP/M, however, will allow the TRS-80 user access to several programs that are not currently available under TRSDOS.

With CP/M, an additional world of languages, utilities and applications programs can become available. Many of these CP/M-based programs do have their counterparts available under TRSDOS, but there are exceptions such as the Department of Defense-sponsored Ada language, and PL/1 from Digital Research. Additionally, TRSDOS-based programs do not always include features provided with the CP/M version. As an example, CP/M Fortran from Microsoft provides a means of generating libraries of subroutines. The TRSDOS version does not have this capability.

Another reason for implementing CP/M on a Radio Shack computer is portability. A program written to one CP/M-based computer is fairly easy to transport to another totally different machine as long as both

are using CP/M. This article is being written using three different computers: a Sanyo, an Otrona, and a Lobo MAX-80. We will see later that portability under CP/M is not quite as smooth as is often advertised.

An incredible amount of material written for CP/M exists as "public domain" software. These programs are available at no charge or, at best, for a very nominal charge to CP/M through SIG/M (Special Interest Group Microcomputers) and CPMUG (CP/M Users Group).

Perhaps the most valid reason for implementing CP/M is to join the trend in 8-bit micros which is to use CP/M as the operating system. Apple has its CP/M boards, the VIC-64 will run CP/M, NorthStar and Heath have used it for years, and Tandy has announced CP/M for its line. With thousands of TRSDOS computers running, CP/M for the Tandy line will not sweep away the old overnight, but Tandy did not bring out CP/M Plus just to fill up dealer shelves.

If the question "Why do it?" has been answered, the next question is "How can CP/M be used on a Model I or Model III?" In all cases, it will be necessary to modify the computer. Most of the modification kits surveyed for this article require removing the Z-80 and replacing it with a circuit board that re-maps memory and, in some cases, adds additional memory.

A standard Radio Shack Model I or III uses the lower several thousand bytes of memory for the BASIC language interpreter, video memory and keyboard. CP/M expects to see the first 256 bytes

filled with specific CP/M values. Standard Radio Shack programs load into memory at about 5200 Hex (about 21,000 decimal), but CP/M programs expect to load at 100 Hex (256 decimal). The conventional Model I/III loads the Disk Operating System (DOS) below the program to be run, but CP/M loads above the program.

The hardware modification must re-locate memory to allow CP/M and programs running under it to load in the proper memory locations. If this is all that is done, the Read Only Memory (ROM) that contains the BASIC interpreter is relocated such that it can no longer be used while in the CP/M mode. The result of this is that the computer now has several thousand fewer bytes of memory than before. To offset this loss, some of the modification boards incorporate an extra set of memory chips so that a full 64K bytes of memory are available for use with CP/M.

Another feature included in many CP/M modification kits is additional video memory so that the computer will be able to display 24 lines of text, each 80 characters long. Eighty character displays have become standard on most computers, except very inexpensive home types. Contrary to some ads that promote the 80-character display as "seeing on the screen what will appear on the page," the 80-character width has its roots in IBM punched cards that provide 80 columns. A potential problem can occur with some Model I monitors when an 80x24 display is used. A Model I was designed to display 64 times 16, or 1024 characters



maximum on the screen. With some Model I displays that have only marginal sharpness, the increased character count can render the video display quite fuzzy. This is not a problem with a properly adjusted video on a Model III.

None of the modification kits cause the loss of standard TRSDOS operating systems. In general, after the board is installed, and upon booting up, a screen message appears asking if you want to run TRSDOS or CP/M. If a TRSDOS disk is inserted into the drive and TRSDOS is selected in response to the menu, the computer will run as it did prior to installing the modification. If CP/M is inserted into the first drive and CP/M selected in response to the menu prompt, CP/M will boot up.

Most modification kits can be installed in under one hour. As noted above, the Z-80 CPU chip is removed and replaced with a small circuit board, and the Z-80 is reinserted into a new socket. Soldering is not

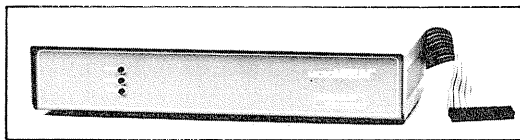
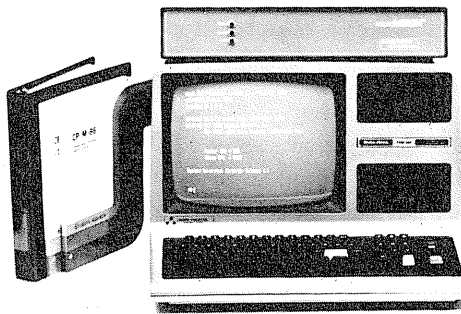
required with most installations, which means that the entire modification can be removed. Some vendors also sell Model III computers with the modifications already installed, and it is possible that some of them will install the kits for you on a Model I (for a price, of course).

After you have completed the modifications and backed up the CP/M system disk, you are ready for what is perhaps the most confusing part of all. How do you get anything to run on this new operating system? Unless you have purchased a package deal that includes hardware and software, you will have only an operating system and several utilities. As yet, there is no BASIC, word processor, or languages. If you have equipped your system with 8-inch drives, you will have no problems, except for the cost of software. If you are running 5 1/4-inch drives, you have just entered the world where every vendor does it his way.

While it is true that CP/M is a standard operating system, physical characteristics of the disk that you use only meet a standard if it is an 8-inch, single-density disk that uses a specified format known as IBM 3740. This type of disk is formatted with 77 tracks, each track having 26 sectors of 128 bytes. The first two tracks are reserved for CP/M. This format also has a specific interleave for the sectors on a track.

Physical sectors on the track may be numbered from 1 to 26, but the logical sectors are not necessarily in the same order. If we think of how a disk reads data, logical sectoring can make sense. Suppose you have a program that has been put on all of the sectors on track 10. When the computer tries to read the data, the disk drive head is first directed to move to track 10. Next, the computer senses where it is on the track by receiving a signal from the index hole on the disk.

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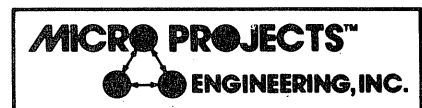
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## Model I/III CP/M

through the disk controller hardware and processed by the computer and operating system. Now the system is ready to read the next sector, but since time was used in processing data from the first sector, the second sector is no longer under the drive head when the computer is ready to read it. Remember — the disk is always spinning when it is being used. The computer can wait until the second sector reappears under the head, which takes time, or the operating system can have an interleave factor, which relates physical sectors to logical sectors. If this is done correctly, spacing between logical sectors on the track will be such that a minimum number of wasted revolutions of the disk will occur.

The standard 8-inch, single-density CP/M disk uses an interleave based on a skew factor of six. In other words, the logical sectors are incremented by six so that the disk expects to read in physical sectors in the sequence: 1, 7, 13, 19, 25, 5, 11 and so on. There is *no* standard skew factor for double-density 8-inch disks, *nor is there any standard for 5 1/4-inch disks.*

In addition to variations in interleave, different CP/M systems may use totally different numbers of sectors per track, sizes of the directory, minimum block allocations, numbers of tracks, single- or double-density, single- or double-sided, or numbers of reserved tracks.

What this means to you is that unless you have a CP/M system that uses the standard 8-inch configuration, diskette interchangeability may not be possible. Many modifications made for the Radio Shack computers have tried to get around this problem by offering a utility with the CP/M operating system that will allow reading of diskettes from other computers. This is a real advantage because, as the number of types of disks your system can read increases, the greater your chances of finding specific programs on a format that you can use.

The Omikron and XEROX 820 formats seem to be very popular alternate formats. In the case of the XEROX 820, almost all CP/M programs can be obtained in this

format. With the announcement of CP/M Plus for the Model 4, I would hope that the existing modification kits will soon offer this format as an additional alternative.

Just because you can read a disk on your CP/M-modified computer, you cannot be sure that the programs on it will operate correctly. Some of the CP/M-based programs require a minimum amount of memory to operate. Prior to selecting a CP/M modification system for your computer, be sure to determine if the available memory will be sufficient. If you elect for one of the 64K systems, you will be safe. Many of the more sophisticated programs use an INSTALL sequence that must be run first. This program is designed to patch the main program to compensate for different types of video widths and characteristics as well as keyboard characteristics.

When considering a CP/M modification to your computer, try to find out if the modification makes your computer emulate one of the standard terminals such as the ADM-3. It is also useful to find out before purchasing how the special keys required for CP/M, and not found on a standard Radio Shack keyboard, are implemented. It is necessary for the modification to redefine some of the keys via software so that they will generate the escape, control and other functions.

As noted above, one of the reasons that CP/M is so popular is a result of the tremendous amount of public domain software available. These programs, which include BASIC, Pascal, C, Fortran, assembly source files and several languages, are free. They are free in the sense that most public domain software is distributed to members of various CP/M users' groups for a nominal charge to cover the cost of the (you guessed it) 8-inch, standard-format disk plus postage.

Another popular source of programs are the remote CP/M bulletin boards that allow you to download programs via a modem. More than 50 of these systems are currently in operation. Phone numbers for a few are included at the end of the article. There is no charge for this, except the telephone

Refer to advertiser index for reader service number



charges you incur. One of the bulletin boards quite often has over 1000 programs and languages on it! It is necessary to use one of the modem programs designed for this type of transfer. Some of these are available in the public domain, but unless you are running 8-inch disks, you may have some problems getting a terminal program up and running. Some of the companies selling CP/M modifications offer terminal programs and independent software houses also offer terminal programs in various formats.

Prior to selecting a modification kit, review the four major system requirements needed for the unit to perform as you want it to. Will you have enough memory? Most CP/M programs will run in a 48K system, but several do require 64K. Is the software you want to run available on the disk format supported by the modification kit? Will you have sufficient disk space? A pair of 35-track, single-density disks is very marginal storage for CP/M usage. As a working minimum, I would

suggest at least two, 40-track, double-density drives. Is the terminal emulation suitable for programs you want to run? This is particularly important for some of the major business programs which require terminal features such as "clear to end of line."

**Omikron**, 1127 Hearst Street, Berkeley, CA 94702, (415) 845-8013. Omikron's "Mapper" is one of the first modification kits, having been around for about three years. In addition to hardware, Omikron also offers substantial discounts on CP/M software to their users. "Mappers" are available for both the Model I and Model III. Omikron offers both 48K and 64K memory versions for either computer as well as 8-inch disk support. *(The 64K Model I version has been unavailable recently as a result of production problems. It should be back on the market soon. —Ed)*

**Microcomputer Technology, Inc.**, 3304 W. MacArthur Blvd., Santa Ana, CA 92704, (714) 979-9923. M.T.I. offers kits for the Model

III as well as fully-assembled Model III computers with conversions already installed. Both 48K and 64K memory versions are available, as well as speed-up boards, and 80x24 display boards. This machine was reviewed in the December, 1982 issue of this magazine. Since then, additional memory capability has been added.

**Memory Merchant**, 14666 Doolittle Dr., San Leandro, CA 94577, (415) 483-1008. Memory Merchant offers Shuffleboard for the Model III. They also offer a package deal of software at the time of hardware purchase, an 80x24 video board option, and a disk controller for 5¼-inch or 8-inch disks. This system will read and write to a variety of other formats including the Osborne 1 and Xerox 820.

**Microhatch**, P.O. Box 501, DeWitt, NY 13214, (315) 446-8031. Microhatch supplies a conversion called Bigmem for the Model I. This conversion fits inside the keyboard and converts the computer to a 64K

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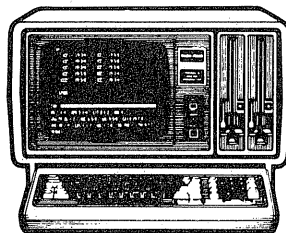
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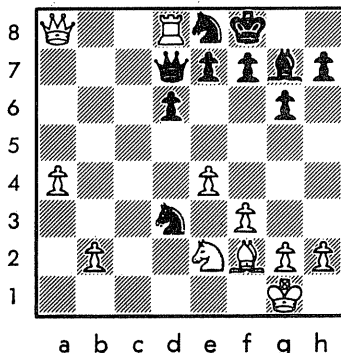
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## Model I/III CP/M

CP/M computer.

**Holmes Engineering, Inc.**, 3555 South 3200 West, Salt Lake City, Utah 84119, (801) 967-2324. Holmes Engineering's VID-80 systems are available for the Model I and III. Different memory size systems as well as an 80x24 video that includes reverse video are available. An expanded version providing 112K bytes of memory is also featured. This system will support 8-inch drives if your existing controller is 8-inch drive-compatible. Holmes expects to provide CP/M 3.0 to support the expanded memory version with bank switching in late 1983. Clock calendar with battery backup as well as speed-up options are available.

**Hurricane Laboratories, Inc.**, 5149 Moorpark Ave., Suite 105, San Jose, CA 95129, (408) 257-8676. Hurricane's Compactor series boards are available in a variety of formats for the Model III. The most basic unit provides a 48K CP/M system, while the most elaborate has 112K of memory, 80x24 video with underline, blink, and reverse video. Compactor supports 35-, 40-, 77- and 80-track 5 1/4-inch disks as well as Winchester hard disks. Operation at 4 megaHertz is built into the Compactor II. The Hurricane unit is able to interchange disks with several different brands of computers, including the XEROX 820 and Omikron. A CP/M-to-CP/M terminal program is also available from Hurricane. A real-time clock is available with integral battery backup.

**Freedom Technology International**, 119 North 18th Street, Philadelphia, PA 19103, (215) 569-2381. Freedom offers modification kits for the Model I, Model III, PMC-80, PMC-81 and LNW. A 64K system is available for CP/M after installing this board. A video display of 80x24 characters is also available. Two different operating systems may be purchased, T8/OS (a Z-80 operating system very similar to CP/M) and CP/M 2.2.

**Radio Shack**, 1500 One Tandy Center, Fort Worth, TX 76102. Radio Shack has announced CP/M 3.0 (CP/M Plus) for the TRS-80 Model 4. We were unable to verify its

operation prior to publication. This CP/M option is available for either Model 4 or upgraded Model III owners.

**LNW Computers**, 2620 Walnut Ave., Tustin, CA 92680, (714) 544-5744. The LNW-II is not a modification, but a complete computer that is fully TRSDOS- and CP/M-compatible. High-resolution graphics, both black and white as well as color, are incorporated in the LNW. All disk sizes are supported, and an 80x24 display is included. Several different formats, including the Omikron are supported.

**Lobo Drives International**, 358 S. Fairview Ave., Goleta, CA 93117, (800) 235-1245. Like the LNW, the Lobo MAX-80 is a complete system running both LDOS and CP/M. All drive sizes are supported and 80x24 video with CP/M is standard. An additional memory expansion is available giving the MAX-80 a total of 128K for CP/M. As of this writing, the MAX-80 is one of the fastest 8-bit computers available. Alternate formats are supported including the XEROX 820 and Omikron.

**Modular Software Associates**, 3533 Prospect Ave., Glendale, CA 91214, (213) 957-3888. Modular is a software house only. They supply a variety of different programs including terminal programs for the LNW, Omikron format and MAX-80 that are compatible with the Source, CompuServe and all of the CP/M bulletin boards.

Two CP/M user groups are: SIG/M, Box 97, Iselin, NJ 08830, and CPMUG, 1651 Third Ave., New York, NY 10028.

### Remote CP/M Bulletin Boards

All of these operate 24 hours per day. There is no charge except for your telephone charges. To transfer files to your computer, they all require a terminal program such as those discussed above.

Rochester RBBS, (716) 223-1100.  
Allentown RBBS/RCPM, (215) 398-3937.

Technical CBBS, (313) 846-6127.  
Pasadena CBBS, (213) 799-1632.  
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BP-4	LEARNING VIC-20 BASIC	2 HR
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# CP/M 2.2 on the Models II/12/16

The most recent offerings from Aton and Pickles & Trout

Terry R. Dettmann, Associate editor

Many Model II/12 owners use TRSDOS exclusively. Primarily because when they bought the system, TRSDOS was included. That is a powerful incentive, but is it enough?

One of the purposes of this article is to answer that question. Is CP/M really better as some claim? How about the availability of programs for CP/M? Are the Model II/12 CP/M's as good as, better than, or worse than TRSDOS?

I must point out that I have seen, and used, the Pickles & Trout version before. I really liked it then and I like it now. When I last reviewed 8-inch CP/M systems, (*May/June, 1981 --Ed*), Pickles & Trout CP/M got my vote.

The Pickles & Trout and Aton CP/M's submitted for this review arrived only weeks ago. I haven't really been able to wring out either version as well as I did the older version of Pickles & Trout CP/M.

For many, CP/M is not just an operating system, it is *the* operating system. As with some programming languages, CP/M has achieved almost cult status. But, by and large, most people who use CP/M use it for practical reasons. It works, it's versatile, numerous programs are available for it, and 8080/Z80 systems can, in general, share software written to work under CP/M.

All this sounds wonderful, right? To see just how wonderful, let's look at how CP/M is put together.

## CP/M's Basic Structure

20 Basic Computing

CP/M is built from three parts: the Console Command Processor (CCP), the Basic Disk Operating System (BDOS), and the Basic Input/Output System (BIOS). Each part has a special purpose.

Users interact with CP/M through the CCP. It displays a prompt for input and waits for a command line to be typed. Once the command line has been entered, the CCP looks to see if it is a built-in command.

There are six built-in commands in the CCP:

TYPE: Types out the contents of a file to the screen.

DIR: Lists the directory of files on the current disk.

REN: Renames a file.

ERA: Erases a file.

SAVE: Saves a machine language program to a disk file.

USER: Allows multiple directory areas within a single directory.

If the CCP can't find the command among those that are built-in, it looks to the current disk to see if there is a command file (ends in '.COM') which matches the command name. Most CP/M systems include the following command files:

SYSGEN: Generates a new CP/M system.

ED: A line-oriented editor for program development.

PIP: A file-copy utility.

ASM: An assembler for 8080 code.

LOAD: Loads an assembled file into memory.

DUMP: Dumps the contents of a file

(in hex).

DDT: A machine language debugging tool.

SUBMIT: A batch command utility.

MOVECPM: Reconfigures CP/M in memory.

STAT: Displays and alters device assignments.

If a command file is found, it is loaded into an area of memory called the TPA (Transient Program Area) and then executed.

While a program is executing, whether it is the CCP or a command file, input and output is handled by calls to the BIOS. The BIOS provides a series of subroutines for primitive level operations on the keyboard, video screen, and so forth. If you were to buy a CP/M system directly from Digital Research Inc., you would have to write the BIOS for your system. Luckily, this is normally done by systems houses who market the systems. Aton and Pickles & Trout are supplied ready to use with the TRS-80 Models II, 12, and 16.

The BDOS handles file system operations, providing services to the CCP in getting file information and managing it.

All put together, the modules of CP/M make a very powerful tool for controlling a small system.

## Aton and Pickles & Trout CP/M

Both of these CP/M's are full function operating systems, though some of the standard functions have been replaced, or supplemented, in various ways. All of these



replacements were improvements of one sort or another.

The Pickles & Trout distribution disk had the command files listed in Table 1 included on the disk. The Aton command files are listed in Table 2. They each cover almost everything you might want to do.

The systems performed well in the limited testing I was able to do. I had more difficulty getting used to the Aton version, but the fault was more mine than theirs.

The utilities for each system were run and each system showed no noticeable failure. The systems were tested on a plain Model II and I didn't check out double-sided, hard disk, nor extended memory abilities. I am working on them and will report any interesting results.

My major complaint is with the transfer programs for TRSDOS. I realize that the intention of both Aton and Pickles & Trout is to sell you on CP/M, but there are times you just might go back to TRSDOS. The utilities should go the other way too!

One of the most significant parts in any software package is the documentation. Both Aton and Pickles & Trout put together quite reasonable documentation. Pickles & Trout specifically pointed out that their documentation is being rewritten. The present form is quite choppy since it has simply been extended, not rewritten, over the last several revisions and is pretty hard to read.

Neither system's documentation is really for the beginner. Aton has a nice beginner's manual for Omniwriter, but the system manual is skimpy. Both systems provide a copy of the Digital Research, Inc.'s operating system manual. Any of you who remember the old Digital Research Inc.'s manuals will be very impressed by the improvement in this one. Also included with each system is a small reference book for CP/M commands from Digital Research, Inc.

I like the Pickles & Trout manual somewhat more because I felt it explained things better, but since it was out of date and being updated, it was tough to use. The sample of their new style (the double-sided diskette manual) was a significant improvement.

### How About Programs?

One of the major questions I hear concerning CP/M is "Is it really true that there are thousands of programs available for CP/M?" The major point raised in advertising seems to be the availability of programs for CP/M that will do practically anything.

Well, the answer is substantially true. For example, through the users groups you can get a wide variety of programs that were written for the CP/M environment. I have a disk from the CP/MUG with many terminal programs on it. There's some pretty good stuff there. MODEM7, one of the programs on the disk, is a good smart-terminal package.

There's one important note to be made about the disk. The programs are all tailored to particular modems and other equipment, and all are in assembly language. If you're comfortable with that, great! If your knowledge of assembly language is skimpy to nil, this is not the disk for you because you will probably have to modify and assemble the program to make it work. (Well, what did you expect from user group software?)

That isn't the case with all user group software. You can get some in BASIC, other languages, compiled, assembled, or ready to work with an assembler. However, don't expect this to solve all of your problems.

Even more, you should realize that software like this comes without a warranty. There's no guarantee that the software doesn't have bugs. It also varies in quality; some is professional, some far less.

So, the answer to the question of availability of programs is both yes and no. Yes if you are a hobbyist who is willing to look for the gems and do your own modifications. No or maybe if you're just looking to buy ready-made software.

If we move out of the user group arena and look at professional packages that are available, there is definitely much to choose from. There are more languages, more accounting packages, generally more of everything, running under CP/M. However, just saying that there are more doesn't make them better.

The major mistake that people make in choosing systems (both

computers and operating systems) is to get the system first and then go looking for the software to do the job they want done. The emphasis should be the other way around. First look into the applications you want. Find one and then buy the computer and operating system that runs it.

If what you want is to get a job done, it's likely (but not certain) that you'll find it running under CP/M. But first find the program, then get the CP/M.

To play with new languages, interesting programs, or just learn new systems, by all means, get CP/M. It will give you more flexibility than TRSDOS.

### Is CP/M Better Than TRSDOS?

That is a loaded question. There is no way to answer it without drawing fire from someone. CP/M has many die-hard adherents. That's great, it deserves its reputation. But is it really better?

When it was first released, it had its problems, just like TRSDOS did. Now, TRSDOS 2.0 and later versions are really pretty good. CP/M 2.2 and later versions are also stable and well-tested. But better?

My feeling is that neither one is better than the other. It is too subjective. I've had a lot of success with both TRSDOS and CP/M. CP/M does some things better than TRSDOS (e.g. it gives you more information on the system and gives you more ability to use it in the manner you choose).

There are a number of books (see the listing of sources) that will help you do very advanced things with CP/M. The same operation would be very difficult to do with TRSDOS. CP/M is just another way of working with the system.

### What Do I Recommend?

In the final analysis, CP/M should be chosen for the reasons given above. If the job you want to do can be found there, get it.

I highly recommend either Aton or Pickles & Trout CP/M. Each has the same basic capabilities at least as far as I was able to test them for this review. Both companies offer some nice features. I am hard-pressed to choose between them.



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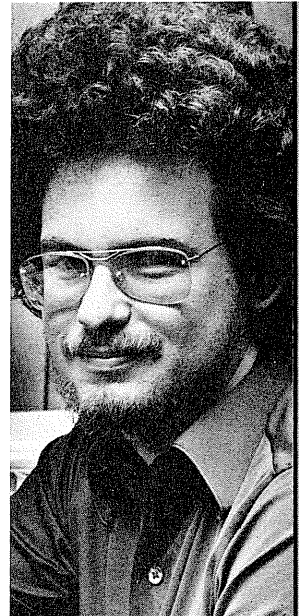
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# CP/M on II/12/16

## Sources for Models II/12/16 CP/M Information

### CP/M Systems

Aton International, Inc., 260 Brooklyn Ave., San Jose, CA 95128, (408) 554-9922.

Pickles & Trout, P.O. Box 1206, Goleta, CA 93116, (805) 685-4641.

Lifeboat, 1651 Third Ave., New York, NY 10028, (212) 860-0300.

(We were unable to verify any TRS-80 CP/M information from Lifeboat but they do offer Model II material.)

### Books

*The CP/M Handbook with MP/M*, by Rodney Zaks, Sybex Publishing, Inc.

*Mastering CP/M*, by Alan R. Miller, Sybex Publishing, Inc.

*Soul of CP/M*, by Waite & Lafore, Howard W. Sams, Inc.

*CP/M Assembly Language Programming*, by Ken Barbier, Prentice-Hall Publishers.

*CP/M Primer*, by Murtha & Waite, Howard W. Sams, Inc.

*Programmer's Guide to CP/M*, by Sol Libes, Microsystems Press.

*Using CP/M*, by Fernandez & Ashley, John Wiley and Sons Publishers.

*Osborne CP/M User Guide*, by T. Hogan, Osborne-McGraw Hill Publishers.

*Inside CP/M*, by D.E. Cortesi, Holt Rinehart & Winston Publishers.

### Magazines

*Microsystems*, edited by Sol Libes, 93 Washington St., Morristown, NJ 07960.

*User's Guide to CP/M Systems & Software*, P.O. Box 3050, Stanford, CA 94305.

### Table 1 Aton CP/M Commands

ASM: 8080 Assembler  
 AUTOEXEC: Auto-boot setup  
 COPY: Disk formatting and image copying  
 DDT: 8080 Debugging tool  
 DUMP: Hex file dump  
 ED: System editor  
 FILEX: Large file transfer/backup  
 HDAUTO: Hard disk auto-boot setup  
 HDBOOT: Hard disk boot if shared with TRSDOS  
 HDCLEAR: Clear hard disk directory  
 HDCOPY: Fast copy with floppies or hard disk  
 HDINIT: Hard disk setup/initialization  
 HDSYSDEF: Hard disk system

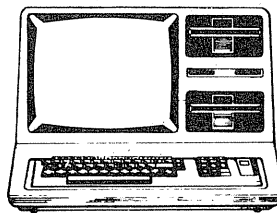
configuration  
 LEVEL2: Extended memory version  
 LOAD: Make '.COM' file out of hex file  
 MOVCPM: Relocate a CP/M system  
 OMNI: Omniwriter text editor  
 PIP: File transfer utility  
 RSCPM: TRSDOS to CP/M file transfer  
 S: Sorted disk directory  
 STAT: File system information  
 SUBMIT: System command file setup  
 SYSDEF: System configuration  
 SYSGEN: Save CP/M systems  
 TIME: Date/time set  
 XDT: Z-80 Debugging tool  
 XSUB: Extended submit

### Table 2 Pickles & Trout Commands

ASM: 8080 Assembler  
 AUTOEXEC: An auto-boot setup command  
 DATIME: Displays date/time  
 DDCHECK: Non-destructive double-density disk check  
 DDCHK2: Double-sided double-density check  
 DDT: 8080 Debugging tool  
 DDTEST: Double-density diskette test  
 DDTEST2: Double sided double-density test  
 DENSITY: Checks marked disk density  
 DUMP: Hex file dump utility  
 ED: System text editor  
 FASTCOPY: Fast diskette copy  
 FORMAT: Single/double density format  
 FORMAT2: Double-sided format  
 HERTZ: 50/60 Hertz power setup  
 IOFREEZE: Save system configuration  
 LOAD: Makes '.COM' files from assembled hex files  
 PIP: File copy utility  
 RESIZER: Makes P&T CP/M system  
 SDCHECK: Single density version of DDCHK  
 SDTEST: Single density version of DDTEST  
 SETCCB: Date/time set for P&T Clock Calendar Board (CCB)  
 SETDATE: Set system date  
 SETMISC: Set system parameters  
 SETTIME: Set system time  
 SETUP: Set I/O & serial parameters  
 STAT: Disk storage information  
 SUBMIT: Command file utility  
 SYNCHRO: Synchronize system date/time to CCB  
 TIME: Display current time  
 TRS2CPM: TRSDOS to CP/M file transfer  
 XSUB: Extended submit utility

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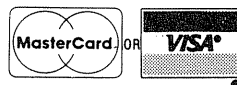
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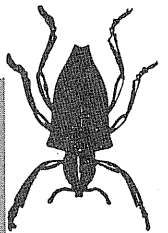
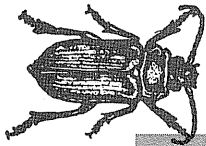


# Four bugs on a rotating square

A graphic solution to a well-known problem in mathematics

Color Computer

Dr. Henry Sonneborn, III, New York, NY

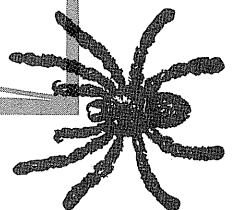
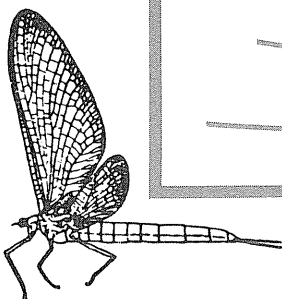


Thirty-five years ago, Rutherford Boyd published an article in *Scripta Mathematica* (June 1948, page 128) in which he presented a number of beautifully-drawn designs made by combining, rotating, and repeating some very elementary geometrical figures. One of his designs based on rotating a series of nested squares, is particularly intriguing since in its visual effect, the squares themselves are overshadowed by four smoothly-rounded curves.

By chance, 10 years later, Martin Gardner in his "Mathematical Games" column in the *Scientific American* (November 1957, page 144) posed an interesting mathematical problem whose solution is strikingly illustrated by Mr. Boyd's design based only on squares.

The problem deals with four bugs (of the non-computer variety) A, B, C, and D. Bugs A and C are male bugs, while B and D are female, and each bug starts out at the vertex of a 10-inch square. As might be expected, A crawls toward B, B toward C, C toward D, and D toward A. All of the bugs travel at the same constant rate until they meet at the center of the square. The question is: How far does each bug travel before they all meet?

In the next issue of the *Scientific American* (December 1957, page 138), Mr. Gardner gave the answer. He first pointed out, however, that the bugs start at "the corners





## Four bugs

of a square which shrinks and rotates as the bugs move closer together." He then went on to say that the fact that each bug always moves perpendicularly to the path of the bug he is pursuing implies that "the length of each spiral path will be the same as the side of the (original) square."

The program listed in this article will simulate the chase of the four bugs and demonstrate the correctness of Mr. Gardner's solution. In the course of doing so, it will reproduce the Boyd design and replicate it to the extent possible on the monitor screen. This replication brings out the unusual effect of the repeated design which Mr. Boyd described and illustrated in his article. While the program was specifically developed for a TRS-80 Color Computer (16K, Extended BASIC), an explanation will be given of its various parts which should make it easy to modify for use with other personal computers.

There are a few mathematical concepts which underlie the program. It is probably best to scan them and then come back to them after running the program on the computer.

1. While the bugs in the problem are said to all be moving simultaneously at constant speed, we can assume instead (without appreciably altering the situation), that the bugs make very small moves in alphabetical order and that the size of every move "M" is a constant percent "P" of the remaining distance from each bug to the bug it is pursuing.

2. The remaining distance between an adjacent pair of bugs at any time is assumed to be the initial distance separating them less the distance that each bug has traveled so far. This assumption is consistent with the fact that the bugs remain at the vertices of a square and the path of each bug is always at right angles to the path of the bug it is pursuing.

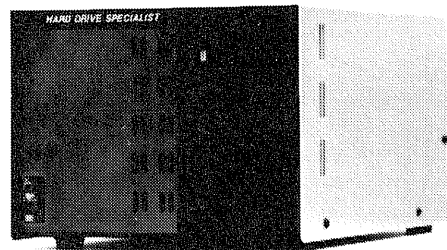
3. To demonstrate visually that the bugs do remain at the corners of a square, the computer will be instructed to draw connecting lines from A to B to C to D, after each round of four moves.

4. After bug A moves a very small distance along the top of a square toward B, B moves down the right-hand side of the square toward C. Since both bugs' moves are the same percent (P) of the side of the square, the angle DR (delta radian) created by B's move from A's viewpoint will have as its tangent:  $(P/100) / (1-P/100)$ . The total angle (R), through which B moves relative to the top of the square, is the sum of many steps, each of which is equal to DR.

5. The distance traveled by each bug per move (M) must be divided into a horizontal and vertical portion so that the computer can adjust the horizontal and vertical coordinates of the bug's position. For bug A, the horizontal adjustment is equal to the individual move times the cosine of the total angle (R) between A and the upper edge of the screen. The vertical adjustment is equal to the individual move times the sine (R). The horizontal and vertical adjustments for the other three bugs also use the distance times the sine and cosine of this angle, but the order and sign of the adjustments must be changed to reflect the different directions in which the bugs travel. The adjustments per move for all four bugs are shown in Table 1.

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## Four bugs

Table 1

Bug	Horizontal	Vertical
A	$M \cdot \cos(R)$	$M \cdot \sin(R)$
B	$-M \cdot \sin(R)$	$M \cdot \cos(R)$
C	$-M \cdot \cos(R)$	$-M \cdot \sin(R)$
D	$M \cdot \sin(R)$	$-M \cdot \cos(R)$

## The Program

The essential parts of the program itself are shown in Table 2.

Table 2

Line(s)	Function
80-140	Set the parameters for the program.
160-180, 230	Determine the 'screen' color set.
190-200	Give the equation relating 'ID' to the actual length 'L' in pixels, and define 'K.'
210-240	Prepare the screen for graphics.
250-260	Color the screen with the foreground color, except for the area to be occupied by the initial pattern.
270	Sets 'X' and 'Y' to zero so that the pattern begins at the upper left-hand corner of the screen. Also sets the initial distance traveled 'SM' to zero.
280-370 and 430-440	Draw paths of the four bugs so that they approach one another by making moves that are a constant percent of the remaining distance between them.
390-420 and 430-440	Draw connecting lines between bugs at the start and after each move by all four, except for the last round of moves.
450-480	Draw connecting lines after the last move by all four bugs.
490	Transfers to 560 if the initial pattern is too large to be replicated.
500-550	Dimensions the array Q so it is able to contain the largest pattern which can be replicated. Then the pattern is replicated to the maximum extent possible, within the PH, PV loops.
560	Sets up an infinite loop to preserve the final pattern on the screen.

## Experiments

1. The pattern developed by the program so far does not permit the four bugs to meet. This is because the final R in line 290 is 1.571 radians (approximately 90 degrees), at which point all four bugs have advanced to the next vertex. We must increase this final angle to 5.0 or more for the paths actually to meet at the center of the square. To do this, we rewrite line 290 as:

290 FOR R=0.0 TO 5.5 STEP DR

2. Running the program with this change is not completely satisfactory since it is impossible to see what



## Four bugs

is really happening in the center of the square as the bugs get very close to one another. To overcome this problem, we change line 380 as follows:

```
380 GOTO 430
```

This eliminates all connecting lines between the bugs except for the final ones. They can be eliminated too, if desired, by changing PSET to PRESET in lines 450-480, but this is not really necessary.

3. Concentrating on the largest square (that is by inputting ID equal to 12), we can determine the distance that each bug has traveled after all four have met in the center. This is done by entering Break after the pattern is complete and then entering the following instruction: Print ID; SM/16. The computer screen will display two numbers that are respectively proportional to the side of the original square and to the total distance that each bug has traveled. As predicted, the two numbers prove to be very close to one another.

4. Finally, we can show that the bugs' paths are not needed to make the design which Mr. Boyd discovered. If we return to the original program and erase the bugs' paths by substituting PRESET for PSET in lines 340-370, the program will present the same patterns as with the paths. In other words, the spirals are formed by the shrinking, rotating squares as well as by the bugs pursuing one another.

### Program Listing for 4 Bugs

```
10 CLS
20 PRINT"          FOUR BUGS"
30 PRINT:PRINT" THIS PROGRAM TRACES THE
PATHS OF FOUR BUGS AT THE CORNERS OF
A SQUARE. THE BUGS PURSUE ONE ANOTHER
IN CLOCKWISE ORDER BY MAKING MOVES THA
T ARE A CON- STANT PERCENT OF THE REM
AIN- ING DISTANCE BETWEEN THEM."
40 PRINT:PRINT" EVERY TIME ALL FOUR BUGS
MAKE A MOVE, LINES ARE DRAWN CONNECT-
ING THEIR POSITIONS."
50 PRINT:INPUT" IF YOU'RE READY TO GO AH
EAD, ENTER 'GA';G$
60 IF G$<>"GA" THEN 50
70 CLS:PRINT:PRINT
80 PRINT" FIRST CHOOSE AN INTEGER 'ID'
BETWEEN 3 AND 12 WHICH IS TO BE PRO
PORTIONAL TO THE INITIAL DISTANCE IN PI
XELS SEPARATING ANY TWO ADJACENT BUGS.
"
90 PRINT:PRINT" IF 'ID' IS 8 OR LESS, TH
E PAT- TERN FORMED WILL BE REPLICAT-
ED TO THE EXTENT PERMITTED BY THE SIZE
OF THE SCREEN."
100 PRINT:INPUT " ID=";ID
110 CLS:PRINT:PRINT:PRINT
120 PRINT" NOW CHOOSE 'P' THE PERCENT OF
THE REMAINING DISTANCE BETWEEN THE B
UGS THAT YOU WANT EACH BUG TO TRAVEL
PER MOVE. 'P' SHOULD BE 12 OR LESS.
"
```

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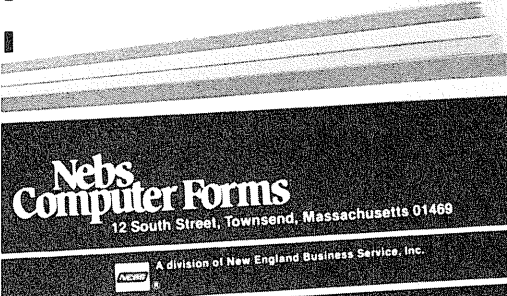
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## Four bugs

```
130 PRINT:PRINT" A GOOD CHOICE FOR 'P' C
ORRES- PONDING TO THE 'ID' YOU'VE
CHOSEN IS"INT(32/ID)+1
140 PRINT:INPUT" P=";P
150 CLS:PRINT:PRINT:PRINT:PRINT
160 PRINT" IF YOU WANT THE DISPLAY TO BE
GREEN ON BLACK, ENTER '0'. IF YOU W
ANT IT TO BE BUFF ON BLACK ENTER'1'."
170 PRINT:INPUT" WHICH COLOR SET DO YOU
WANT";CS
```

```
180 IF CS<>0 AND CS<>1 THEN 150
190 L=ID*16: REM 'L' IS THE INITIAL
DISTANCE BETWEEN AD- JACENT BUGS IN P
IXEL UNITS.
```

```
200 K=L-1
```

```
210 CLS
```

```
220 PMODE 4,1
```

```
230 SCREEN 1,CS
```

```
240 PCLS
```

```
250 LINE(K,0)-(255,K),PSET,BF
```

```
260 LINE(0,L)-(255,191),PSET,BF
```

```
270 X=0:Y=0:SM=0
```

```
280 DR=ATN((P/100)/(1-P/100))
```

```
290 FOR R=0.000 TO 1.572 STEP DR
```

```
300 SM=SM+M: REM 'SM' IS THE SUMOF THE I
NDIVIDUAL MOVES 'M' MADEBY ANY ONE OF TH
E BUGS.
```

```
310 M=(P/100)*(L-SM): REM 'M' IS THE L
ENGTH OF ONE MOVE MADE BY A SINGLE BUG.
```

```
IT IS A CON- STANT PERCENT OF THE REM
AINING DISTANCE BETWEEN ADJACENT' BUGS.
```

```
320 H=M*COS(R):V=M*SIN(R)
```

```
330 XX=X+H:YY=Y+V
```

```
340 LINE(X,Y)-(XX,YY),PSET
```

```
350 LINE(K-Y,X)-(K-YY,XX),PSET
```

```
360 LINE(K-X,K-Y)-(K-XX,K-YY),PSET
```

```
370 LINE(Y,K-X)-(YY,K-XX),PSET
```

```
380 REM CONNECTING LINES FOLLOW
```

```
390 LINE(X,Y)-(K-Y,X),PSET
```

```
400 LINE-(K-X,K-Y),PSET
```

```
410 LINE-(Y,K-X),PSET
```

```
420 LINE-(X,Y),PSET
```

```
430 X=XX:Y=YY
```

```
440 NEXT R
```

```
450 LINE(X,Y)-(K-Y,X),PSET
```

```
460 LINE-(K-X,K-Y),PSET
```

```
470 LINE-(Y,K-X),PSET
```

```
480 LINE-(X,Y),PSET
```

```
490 IF ID>8 THEN 560
```

```
500 DIMQ(0,576)
```

```
510 GET(0,0)-(K,K),Q
```

```
520 FOR I=0 TO INT(256/L)-1
```

```
530 FOR J=0 TO INT(192/L)-1
```

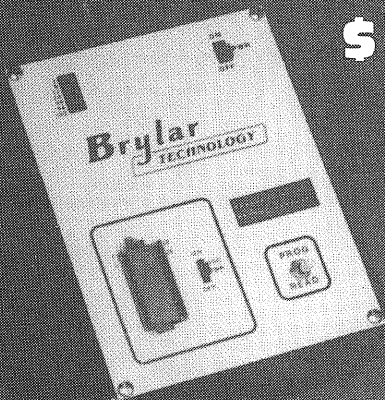
```
540 PUT(I*L,J*L)-(I*L+K,J*L+K),Q
```

```
550 NEXT J,I
```

```
560 GOTO 560
```

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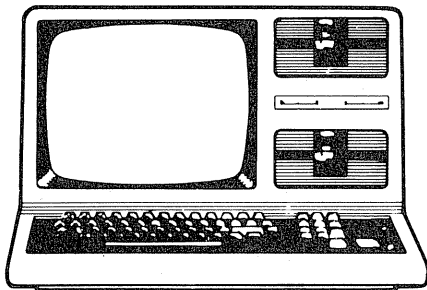
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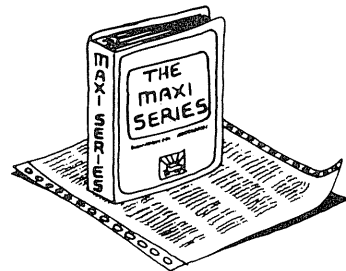
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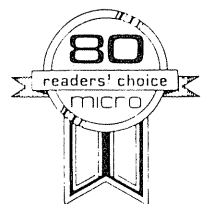
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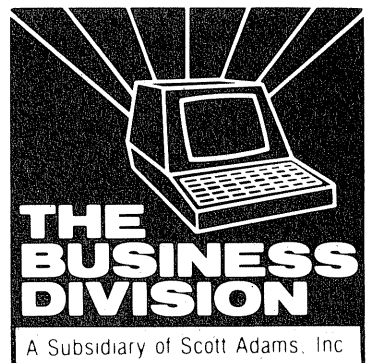


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# Model 100 communications

## Save money and build your own null-modem adapter

### Model 100

One of the reasons that I purchased a TRS-80 Model 100 was its portable word processor. Whenever I finished writing a document on the 100, I intended to dump it into my TRS-80 Model I using the 100's telecommunication program "TELECOM." Once the document was in the Model I, I'd use Scripsit to clean it up and format it for printing.

All I had to do was connect the Model 100 to the Model I. The Model 100 has a built-in RS-232C interface

and this seemed to provide the most direct way to hook the two computers together. The Model 100's manual described how to make this interconnection. All that was required was an RS-232C cable assembly and a "null modem adapter."

I already had the cable, but I needed the adapter. I checked the Radio Shack computer catalog and discovered that the adapter cost \$29.95! I had never heard of a null

Stan Horzepa, Waterbury, CT

modem adapter, but being in the modem business for nearly four years, I had a good idea what was required. I was confident that I could put one together for substantially less than \$29.95.

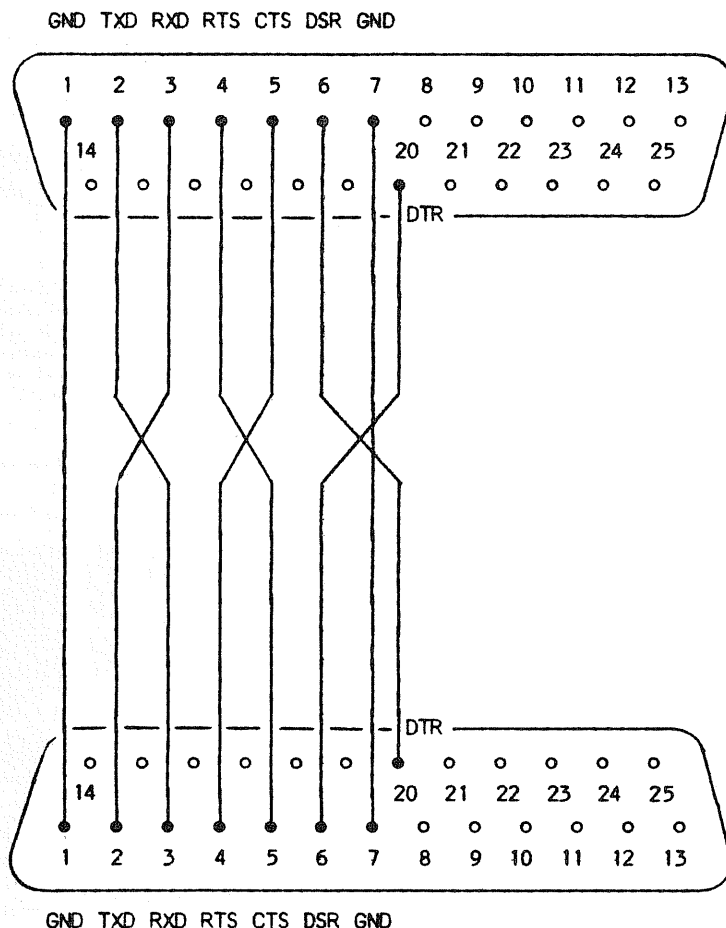
RS-232C is a serial interface intended to connect a computer to a modem. The interface provides a separate line for data going from the computer to the modem (transmitted data) and a separate line for data going from the modem to the computer (received data). Separate lines are also provided for handshaking signals between the computer and modem. Essentially, the handshaking signals (data set ready, data terminal ready, request to send, and clear to send) assure that both the computer and modem are ready before they begin interchanging data.

This all works smoothly when you have a computer and modem interconnected via RS-232C. However, when you have two computers interconnected via RS-232C, nothing happens because both computers are attempting to use the same lines to exchange the same signals.

For example, pin 2 of RS-232C is the transmitted data lead. Normally, the computer sends data down this line to the modem and the modem sends this data over the telephone line. However, when two computers are on either end of the RS-232C connection, they both send data down the same line (via pin 2). The data from one computer bumps into data coming from the other computer and, needless to say, the data goes nowhere fast.

The solution is simple. (This is the function of the null modem adapter.) The data and handshaking signals at one end of the RS-232C interface must be wired to their complemen-

Figure 1—Wiring for null modem adapter.





tary signals at the other end of the interface. For example, transmitted data (pin 2) at one end of the interconnection must be wired to received data (pin 3) at the other end.

One way of accomplishing this is to rewire the connector at one end of the RS-232C cable. However, if you rewire the cable for computer-to-computer interfacing, it cannot be used for computer-to-modem interconnection without reverting back to the original wiring configuration. Since I had only one cable and desired to use it for both computer-to-computer and computer-to-modem interfacing, I had to build a null modem adapter.

The only major components that are needed are one male and one female DB-25 connector (Radio Shack part numbers 276-1547 and 276-1548). The pair can be purchased for less than \$7.

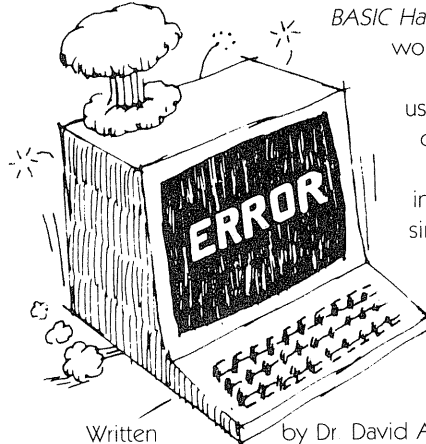
Wiring the connectors together is simple. Pin 2 of each connector is wired to pin 3 of the opposite connector (the transmitted-data and received-data pins). Pin 4 of each connector is wired to pin 5 of the opposite connector (the request to send and clear to send handshaking signal pins). Pin 6 of each connector is wired to pin 20 of the opposite connector (the data set ready and data terminal ready handshaking signal pins). Grounds are provided on pins 1 and 7. Pin 1 of the connector is wired to pin 1 of the opposite connector. Pin 7 is wired to pin 7 as well. The remaining pins are not wired. The connector wiring is illustrated in Figure 1).

To stabilize this arrangement, I dug into my junk box and came up with a pair of chassis mounts that I attached to each connector with screws through the connector mounting holes. If your junk box is not as prolific as mine, you can use two short pieces of wooden dowel and four wood screws to accomplish the same task.

That completes the construction of the adapter. Plug the male end of the adapter into the Model 100's RS-232C connector, plug the RS-232C cable into the female end of the adapter, run the Model 100 TELCOM, and you are ready to upload and download data between your Model 100 and another computer.

## When your computer won't speak your language, you need a basic handbook.

As a matter of fact, everyone who works in BASIC needs *The BASIC Handbook*. It is the definitive reference work on the subject of BASIC.



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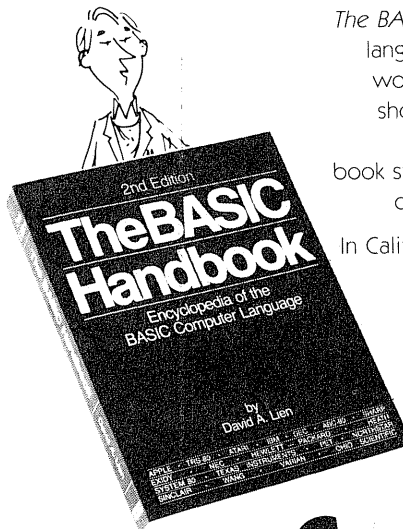
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# Keytoken

## A single-stroke keyword entry utility

Models I/III

David Lewis, Shady, NY

Microsoft thoughtfully provided us with a shorthand for one BASIC command: The "?" can be used for PRINT. But, what about other common keywords such as GOSUB, NEXT, PEEK and RETURN? Keytoken/CMD is a short keyboard driver that allows a similar shortening of these and many other commands in your 4K TRS-80 Model I/III, LNW80 or PMC-80.

Anytime you want to use a BASIC keyword that Keytoken shortens, enter the driver by pressing the @ key. Then just press the letter corresponding to the reserved word you want (the chart is included in the source code). Keytoken will translate the letter into the byte that the BASIC interpreter uses to

represent the keyword, tricking it into thinking that you just typed I-N-K-E-Y-\$, for example, instead of @I.

Doing this has its advantages and disadvantages. The bytes BASIC uses to represent its codewords are in the range 80H to FBH, which are also used to represent graphics and space-compression characters. This has the effect of making the screen look messy. Even with a space-compression character, though, the command can be erased with one backspace. LISTing the line will show that the conversion worked. An advantage, on the other hand, exists precisely because of the odd screen: by entering the driver after

you've typed an open quote, you can pack strings with graphics characters while typing the line.

### Modifying Keytoken

I have chosen Keytoken's words by the size of the word, how often it is used, and whether it has a \$ associated with it. I've assigned the words alphabetically whenever possible. You can change the command associated with a letter by substituting a new byte value in the TABLE. Tape users will probably want to get rid of FIELD and MERGE, for example. A good manual on assembly language or a memory map will contain a complete list. For now, I hope you enjoy it as it is.

### Program Listing for Keytoken

```
00050 ;KEYTOKEN BY DAVID LEWIS, SHADY, NY 12479
00060 ;PRESS '@' AND THEN A LETTER TO PRODUCE A BASIC KEYWORD
00070
FE00 00080      ORG      0FE00H ;RELOCATABLE UPON RE-ASSEMBLY
FE00 2A1640    00090      LD      HL,(4016H) ;FIND KEYBOARD DRIVER ADDRESS
FE03 220EFE    00100      LD      (START+1),HL ; AND SAVE IT
FE06 210DFE    00110      LD      HL,START ;FIND NEW KEYDRV ADRS
FE09 221640    00120      LD      (4016H),HL ; AND SAVE IT
FE0C C9       00130      RET      ; AND RETURN TO DOS
00140
00150 ; MAIN PROGRAM. PROTECT MEMORY HERE
FE0D CD0000    00160 START CALL  0000 ;CALL OLD KEYDRV
FE10 FE40     00170      CP      '@' ; IS CHARACTER ENTRY CHAR?
FE12 C0       00180      RET      NZ ; NO:RETURN TO BASIC
00190
FE13 CD4900    00200      CALL   49H ;ELSE: GET NEXT CHARACTER
FE16 FE41     00210      CP      65 ;MAKE SURE IT'S A-Z
FE18 3811     00220      JR      C,EXIT
```



```

FE1A FE5B      00230      CP      91
FE1C 300D      00240      JR      NC,EXIT
                00250
                00260 ;REPLACEMENT. ALPHABETICAL CHARACTER IN A REGISTER.
FE1E D641      00270      SUB     65 ;SHIFT SET FROM 65-90 TO 0-25
FE20 DD212EFE  00280      LD      IX,TABLE ;BEGINNING OF TOKEN TABLE
FE24 3229FE    00290      LD      (OFFSET+2),A ;INSERT BYTE OFFSET
FE27 DD7E00    00300 OFFSET LD      A,(IX+00) ;TOKEN VALUE NOW IN A
FE2A C9        00310      RET     ;RETURN TO BASIC WITH NEW BYTE
                00320
FE2B 3E40      00330 EXIT LD      A,'@' ;RESTORE ENTRY CHAR
FE2D C9        00340      RET
                00350
FE2E F6        00360 TABLE DEFB    246 ;A ASC (ASCII 65)
FE2F 8E        00370      DEFB    142 ;B RUN
FE30 B8        00380      DEFB    184 ;C CLEAR
FE31 99        00390      DEFB    153 ;D DEFINT
FE32 95        00400      DEFB    149 ;E ELSE
FE33 A3        00410      DEFB    163 ;F FIELD
FE34 91        00420      DEFB    145 ;G GOSUB
FE35 8D        00430      DEFB    141 ;H GOTO
FE36 C9        00440      DEFB    201 ;I INKEY$
FE37 9E        00450      DEFB    158 ;J ERROR
FE38 AA        00460      DEFB    170 ;K KILL
FE39 AF        00470      DEFB    175 ;L LPRINT
FE3A A8        00480      DEFB    168 ;M MERGE
FE3B 87        00490      DEFB    135 ;N NEXT
FE3C A2        00500      DEFB    162 ;O OPEN
FE3D C6        00510      DEFB    198 ;P POINT
FE3E F9        00520      DEFB    249 ;Q RIGHT$
FE3F 92        00530      DEFB    146 ;R RETURN
FE40 C4        00540      DEFB    196 ;S STRING$
FE41 CA        00550      DEFB    202 ;T THEN
FE42 BF        00560      DEFB    191 ;U USING
FE43 C0        00570      DEFB    192 ;V VARPTR
FE44 E5        00580      DEFB    229 ;W PEEK
FE45 B1        00590      DEFB    177 ;X POKE
FE46 86        00600      DEFB    134 ;Y RANDOM
FE47 AE        00610      DEFB    174 ;Z SYSTEM (ASCII 90)
                00620
FE00           00630      END     0FE00H
    
```

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# Files and foibles

## A units conversion program that learns what to do

For all models

Terry R. Dettmann, Associate editor

A knotty problem with file handling is choosing the most appropriate method of file handling for a given job. A lot of people seem to think that random files are always better. Many of them have never tried random files, but see some neat things being done with them and assume that that's all it takes, just go random.

Unfortunately, it's not that simple. Random files introduce the need for extensive record keeping by the programmer. Often, a simple sequential file will make the programming simpler and the program run faster.

A simple case is the units conversion program included in this article. To do the units conversion, we simply have a table in memory that keeps the conversion factors, as we learn them. To save the table from session to session, we simply write it out to a sequential file, in a known way, and it's done.

By using a sequential file, we gain a speed advantage since the table is processed at memory speeds. This means we can do quite a bit of processing for table maintenance.

Furthermore, sequential file routines for handling input and output are very easy to write. The routines at lines 7000 and 8000 are almost mirror images of each other. This makes them very easy to understand.

Let's look through the program, module by module, and see its high points:

- 10-60 Initialize the parameters and values needed.
- 200-250 Main command loop; get a command, figure out what it is, and execute it.
- 1000-1020 Get a command line.
- 1100-1120 Wait for the enter key.
- 2000-2100 Break the command line into words.
- 3000-3050 Interpret the command line.
- 5000-5010 End the program.
- 6000-6120 Display helpful information.
- 7000-7080 Save the in-memory data to a file. (Note the use of the variable MX to control the write loop as well as its use in the DIMension statement. If I want a bigger table, all I need do is make MX larger and everything else in the program works properly!)
- 8000-8080 Load a file from disk. Since I am always dealing with files of the same size, unless I change MX, there is no need for an End-of-File check. This method wastes some disk space, but if the tables are small it's no problem.
- 9000-9095 Master routine for doing the conversions. Its

sequence is: break the line into words, locate each unit, and perform the indicated conversion.

9100-9130 Search for a unit.

9200-9240 Add a unit to the table.

9300-9350 Actually do a conversion and print the results.

9400-9470 Enter an unknown conversion factor.

9500-9550 Update the conversion table for the new factor.

Walk through the listing to see how it works. When typing it in, remark lines that begin with an apostrophe can be deleted, while those that begin with REM are required.

The program doesn't have a number of features that would be nice to have. Try to introduce a way to get a listing of the units in the table, delete units from the table (this is tricky, so watch it!), and a way of handling different classes of units such as length or volumes other than having different files for each classification. The program does not work if both units in the formula are not in the table.

Try playing with some of these ideas to see if you can make the program do the things suggested, or better yet, come up with ideas of your own. Good luck.

### Sample unit conversion

When the program asks for input, first type 'HELP' to get a command summary. To do a conversion, type a line like this:

**10 IN CM**

This means, "Give me 10 inches in centimeters." (This is the one conversion that is built into the program.) The answer will appear as:

**25.4 CM = 10 IN**

If you ask something like:

**10 FT IN**

which means "What is 10 feet expressed in inches?" The program doesn't know that, so it tells you so and then asks for the conversion factor from feet to inches. Just type '12' because you multiply the number of feet by 12 to get inches.

Now that feet are entered, you can convert between feet, inches, and centimeters. It is possible because the conversions for feet to centimeters, as well as the inverse conversions, are automatically computed once the one conversion is known.





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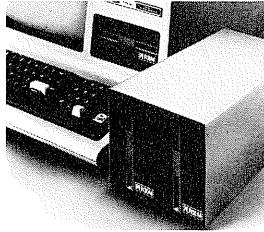
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## Files and foibles

The only restrictions you have are that all units must be of the same form (one file saved for lengths, another for areas, etc.), and you are limited by the size of the arrays (set by the variable MX).

### Program Listing for UNITS/BAS

```
1 ' UNIT CONVERSION
2 ' TERRY R. DETTMANN
3 '
4 ' -----
9 ' CLEAR SPACE FOR STRINGS
10 CLEAR1000
15 'MX IS THE NUMBER OF ENTRIES ALLOWED
20 MX=5
25 'SETUP THE NAME AND CONVERSION ARRAYS
30 DIM CV(MX,MX),NM$(MX)
35 ' INITIALIZE INCHES & CENTIMETERS
40 NM$(0)="IN":NM$(1)="CM"
50 CV(0,0)=1:CV(1,1)=1
60 CV(1,0)=1/2.54:CV(0,1)=2.54
200 REM --- MAIN LOOP
210 CLS:PRINT"UNITS CONVERSION"
220 PRINT:PRINT
225 ' READ A COMMAND LINE THEN BREAK
226 ' IT DOWN
230 GOSUB1000:GOSUB3000
235 ' EXECUTE THE SUBROUTINE FOR THE
236 ' COMMAND
240 ON CMD GOSUB5000,6000,7000,8000,9000
250 GOTO200
1000 REM --- ENTER COMMAND
1005 ' GET A COMMAND LINE
1010 LINEINPUT"COMMAND">>" ;LN$
1012 ' COMMAND 'MENU' ENDS PROGRAM
1013 'DELETE LINE 1015 ON MODELS OTHER T
HAN MODEL 100
1015 IF LN$="Menu" THEN MENU
1020 RETURN
1100 REM --- WAIT HERE
1105 ' ACCEPT ANYTHING
1110 LINEINPUT"PRESS <ENTER>";A$
1114 ' THIS COMMAND LINE IS FOR MODEL 10
0 -DELETE IT ON OTHER MODELS
1115 IF A$="Menu" THEN MENU
1120 RETURN
2000 REM --- PARSE COMMAND
2005 ' BLANK COMMAND ARRAY
2010 FORI=0TO2:A$(I)="" :NEXTI
2015 ' LC IS THE WORD NUMBER
2016 ' FLG IS FOR BLANK RECOGNITION
2020 LC=-1:FLG=0
2025 ' LOOP OVER ALL CHARACTERS IN LINE
2030 FORI=1TOLEN(LN$)
2040 C$=MID$(LN$,I,1)
2045 ' BLANK AND NOT IN A WORD
2050 IF C$=" " AND FLG=0 THEN 2090
```



## Files and foibles

```

2055 ' BLANK AND IN WORD MEANS
2056 ' WE'RE AT THE END OF A WORD
2060 IF C$=" " AND FLG=1 THEN FLG=0:GOTO
2090
2065 ' TO GET HERE, WE MUST BE IN A WORD
2066 ' IF FLG=0 THEN THE WORD IS JUST
2067 ' STARTING
2070 IF FLG=0 THEN FLG=1:LC=LC+1
2075 ' ADD THE CHARACTER TO THE
2076 ' CURRENT WORD
2080 A$(LC)=A$(LC)+C$
2090 NEXT I
2092 ' IF THERE ARE LESS THAN 2 WORDS,
2093 ' THEN THERE IS AN ERROR
2095 IF LC<2 THEN EF=1 ELSE EF=0
2100 RETURN
3000 REM --- PARSE COMMAND
3002 ' CMD = 5 MEANS IT'S A CONVERSION
3005 CMD=5
3008 ' 'END' ENDS THE OPERATIONS
3010 IF LN$="END" THEN CMD=1
3015 ' 'HELP' PRINTS A HELP SCREEN
3020 IF LN$="HELP" THEN CMD=2
3025 ' 'SAVE' SAVES THE CURRENT TABLE
3030 IF LN$="SAVE" THEN CMD=3
3035 ' 'LOAD' LOADS A TABLE
3040 IF LN$="LOAD" THEN CMD=4
3050 RETURN
5000 REM --- END PROGRAM
5010 CLS:PRINT"BYE":END
6000 REM --- HELP COMMAND
6010 CLS:PRINT"HELP":PRINT
6020 PRINT"END - END OF PROGRAM"
6030 PRINT"HELP - THIS LIST"
6040 PRINT"SAVE - SAVE CONVERSION TABLE"
6050 PRINT"LOAD - LOAD CONVERSION TABLE"
6060 PRINT
6070 PRINT"TO DO A CONVERSION ENTER"
6080 PRINT"THE NUMBER, FOLLOWED BY THE"
6090 PRINT"ORIGINAL UNIT, AND FINALLY"
6100 PRINT"THE DESTINATION UNIT"
6102 PRINT"E.G. 10 FT IN"
6105 PRINT
6110 GOSUB 1100
6120 RETURN
7000 REM --- SAVE COMMAND
7010 CLS:PRINT"SAVE TABLE":PRINT
7015 ' LOOK FOR A FILENAME
7020 LINEINPUT"FILENAME: ";FF$
7025 ' OPEN IT FOR OUTPUT
7030 OPEN"O",1,FF$
7035 ' FIRST WRITE THE NAMES
7040 FORI=0TOMX:PRINT#1,NM$(I):NEXTI
7045 ' NEXT WRITE THE CONVERSIONS
7050 FORI=0TOMX:FORJ=0TOMX
7060 PRINT#1,CV(I,J)
7070 NEXTJ:NEXTI

```

# THE COMPUTER CONNECTION

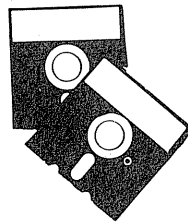
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## Files and foibles

```

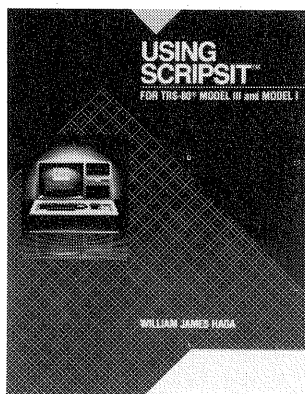
7080 CLOSE:RETURN
8000 REM --- LOAD COMMAND
8010 CLS:PRINT"LOAD TABLE":PRINT
8015 ' GET THE FILENAME
8020 LINEINPUT"FILENAME: ";FF$
8025 ' OPEN THE FILE FOR INPUT
8030 OPEN"I",1,FF$
8035 ' GET THE NAMES
8040 FORI=0TOMX:LINEINPUT#1,NM$(I):NEXTI
8045 ' GET THE CONVERSIONS
8050 FORI=0TOMX:FORJ=0TOMX
8060 INPUT#1,CV(I,J)
8070 NEXTJ:NEXTI
8080 CLOSE:RETURN
9000 REM --- CONVERSION
9005 ' PARSE THE LINE
9010 GOSUB2000:IF EF=1 THEN 9095
9015 ' SECOND WORD IS THE UNIT
9016 ' CONVERTED FROM, FIND IT IN
9017 ' THE TABLE
9020 IN$=A$(1):GOSUB9100:IF IN<0 THEN GO
SUB9200
9025 ' IF IT WON'T GO IN THE TABLE,
9026 ' THEN THE TABLE IS FULL
9030 IF IN<0 THEN 9090 ELSE A(1)=IN
9035 ' THE THIRD WORD IS THE UNIT TO
9036 ' CONVERT TO, FIND IT

```

```

9040 IN$=A$(2):GOSUB9100:IF IN<0 THEN GO
SUB9200
9050 IF IN<0 THEN 9090 ELSE A(2)=IN
9055 ' DO THE CONVERSION
9060 GOSUB9300
9070 RETURN
9090 PRINT"TABLE FULL":GOSUB1100:RETURN
9095 PRINT"INPUT ERROR":GOSUB1100:RETURN
9100 REM --- FIND THE CONVERSION
9105 ' LINEAR SEARCH FOR UNIT, RETURN
9106 ' -1 IF IT ISN'T FOUND
9110 FORI=0TOMX
9120 IF IN$=NM$(I) THEN IN=I:RETURN
9130 NEXTI:IN=-1:RETURN
9200 REM --- NOT IN TABLE
9205 ' FIND AN EMPTY SPACE AND ENTER
9206 ' THE UNIT THERE
9210 FORI=0TOMX
9220 IF NM$(I)="" THEN NM$(I)=IN$:IN=I:R
ETURN
9230 NEXTI
9240 RETURN
9300 REM --- DO CONVERSION
9305 ' GET THE CONVERSION FACTOR
9310 A=CV(A(1),A(2))
9315 ' IF IT ISN'T THERE, THEN GET IT
9320 IF A=0 THEN GOSUB9400
9325 ' DO THE CONVERSION & PRINT RESULT
9330 PRINTA*VAL(A$(0));" ";A$(2);" = ";A
$(0);" ";A$(1)
9335 ' WAIT HERE
9340 GOSUB1100
9350 RETURN
9400 REM --- NEW CONVERSION
9410 PRINT"I DON'T KNOW THAT ONE"
9420 PRINT"WHAT IS THE CONVERSION FROM"
9430 PRINT A$(1);" TO ";A$(2);"?"
9435 ' ENTER THE NEW CONVERSION
9440 INPUTA
9445 ' PUT IT IN THE TABLE, ON OPPOSITE
9446 ' SIDES OF THE TABLE, CONVERSIONS
9447 ' ARE INVERSES OF ONE ANOTHER
9450 CV(A(1),A(2))=A:CV(A(2),A(1))=1/A
9460 GOSUB9500
9470 RETURN
9500 REM --- UPDATE TABLE
9505 ' STEP THROUGH THE TABLE AND
9506 ' FILL IN ALL CONVERSIONS GIVEN
9507 ' THE NEW CONVERSION FACTOR
9510 FORI=0TOMX
9520 IF I=A(2) THEN 9540
9530 CV(A(1),I)=CV(A(1),A(2))*CV(A(2),I)
9531 ' PROTECTION FOR DIVIDE BY ZERO
9532 IF CV(A(1),I)=0 THEN 9540
9535 CV(I,A(1))=1/CV(A(1),I)
9540 NEXTI
9550 RETURN

```



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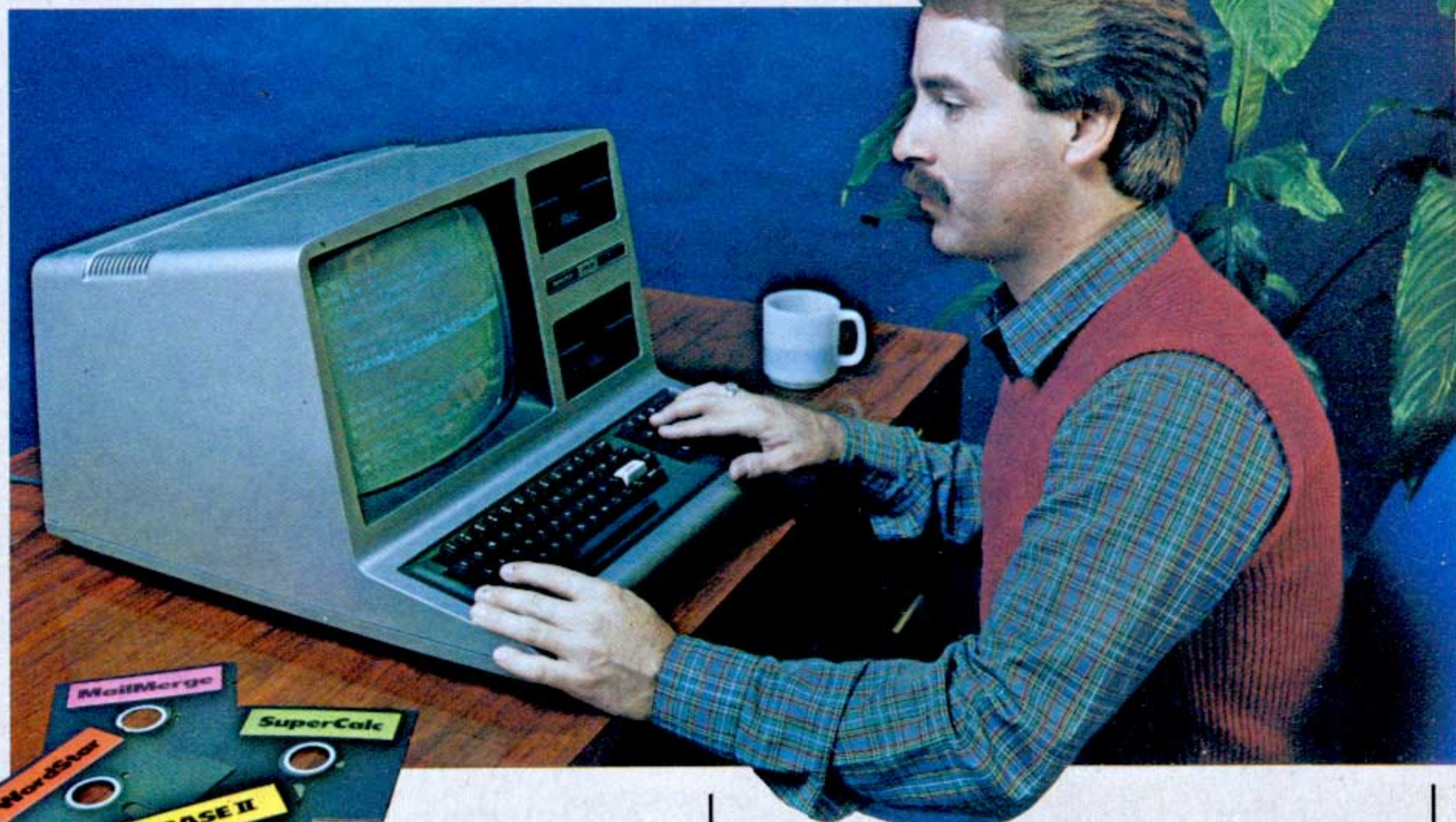
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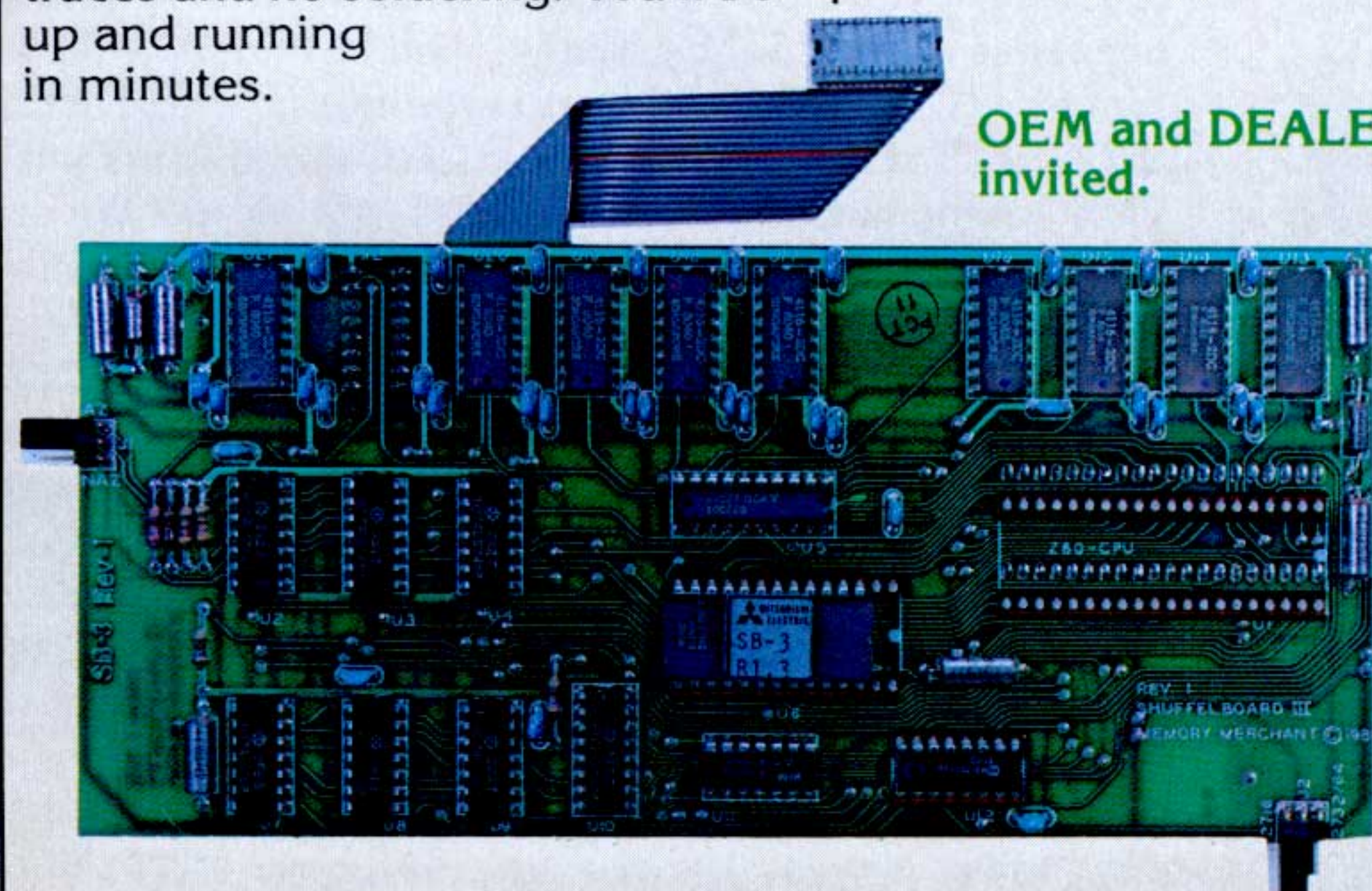
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# So, what's your GQ?

## The foggy world of the Gobbledegook

Models I/II/III

Margaret Silbar, Los Alamos, NM

I am a science writer, editorial consultant, and a long-time believer in humor as a way of getting people to do things they otherwise wouldn't. To see when I, and the scientists I work with, stop being clear, I wrote a BASIC program for my word-processing Model III. It analyzes a text file and it calculates a "Gobbledegook Quotient," or GQ for short.

The Gobbledegook has been described by Eugene McCarthy and James Kilpatrick as "a lamentable beast," which has "the windy inflatability of the blowfish . . . Owing to cloudy vision, once he has launched into a sentence, he cannot see his way clear to the end."

The program GQ is a useful tool for keeping the galloping Gobbledegook within reasonable bounds. Since the ASCII codes for letters, numbers and punctuation are pretty well standardized, it could easily be modified for computers other than TRS-80's. Nonetheless, GQ as given here is slightly specialized to

TRSDOS BASIC. It works well with Scripsit files (if they have been saved as ASCII files).

In general, the lower the GQ, the clearer the text. As one example, the King James version of the Twenty-third Psalm has a GQ of 4. A low GQ implies both short sentences and simple words. There are no long sentences in the psalm and the only two difficult words are "righteousness" and "annointest." In newer versions of the psalm, even these words have disappeared, bringing the GQ down to 3. The basic point of a low GQ is this: the less time a reader has to spend wading through purple prose, the more time he will have for digesting ideas.

It is commonly thought, wrote McCarthy and Kilpatrick, that the Gobbledegook resides only at seats of government. "Not true," they say. "The beast is everywhere" — in letters, memos, reports and articles, to say nothing of instructions for everything from filling out an income tax form, to putting up a storm door or figuring out how to use a newly-bought piece of software.

For me, the GQ is one way of fighting the Gobbledegook. Its numerical value is loosely tied to grade level in reading ability. When a scientist assures me that his meaning is crystal clear ("Even my fourth grade daughter can understand it"), I can now run the text through GQ. I praise his daughter's advanced educational level when the GQ turns out to be over 20.

On the other hand, you can use the GQ to peg a piece of writing to a particular audience, or just to have a bit of fun. I'll bet you didn't know that Lewis Carroll's famous nonsense poem, "Jabberwocky," scores under 3, or that Lincoln's Gettysburg Address reads like an article in the *Atlantic Monthly* with a GQ of 12. Compare this with FDR's famous fireside chat in 1941, telling us "We are now in this war." It had a GQ of 8.5. JFK's 1961 message to Congress asked that we land a man on the moon and return him safely to earth. That had a GQ of 13. This article has a GQ of 7.4.

On to a few basics. The GQ program is adapted from a formula of Robert Gunning's. It relates the (weighted) number of long (and thus, Gunning says, "hard") words and the average number of words per sentence. You can use the program to analyze your entire letter, report, article, whatever. It is a bit slow, however, since a lot of string manipulation is involved. If the text is very long, you may choose to analyze only an occasional paragraph or two of it. To give accurate statistics, however, a sample should have at least 100 words.





The BASIC program scans each line of the ASCII file that is to be GQ'd. (Such lines must be no longer than the logical record length, which is assumed to be 255 characters.) Anything that is punctuated as a sentence is counted as a sentence. However, one or two letters followed by a period are ignored since they are almost always abbreviations or initials. The program also counts the number of words by searching for spaces. At the end of text input, it divides the total number of words by the total number of sentences. This gives the average number of words per sentence. The program also keeps tab of long sentences — those with more than 20 words. It prints out the total number of sentences, the total number of words, the average sentence length, and the number of long sentences.

The GQ differs from other indices of its type in the way that it flags "hard" (big) words. In the original Gunning Index, for example, a big word is one with three syllables or more. To check this would require a word list (memory and money) or a complicated way of figuring out where the syllables are. GQ thus defines a big word as one with more than nine characters. Proper nouns (that is, capitalized words) are not counted. Despite the change, the original Gunning Index and GQ give pretty much the same numerical results. It is sometimes fun to re-define a big word as one with more than eight characters (line 690) and see how much the GQ changes.

The percentage of big words is also printed at the end of the program and they are listed. This can be quite useful. For example, in recently reading a manuscript on (of all things) sex, I found my attention straying. It turned out that part of the problem was simply the overuse by the author of certain big words. Seeing the big word lists from various samples of writing alerted me to this.

A few words of warning. The GQ, or any such index, is not a perfect weapon for fighting the Gobbledegook. Lewis Carroll's poem "Jabberwocky" comes in under 3, but no one would ever say that poem is "easy." Yet another pitfall is that a piece of prose may be very readable, but so dull that it is likely not to be read all the way through; or, readable, but missing the point. An example of the latter is a recent letter from my insurance company which told me that through no fault of my own it was necessary to cancel my homeowner's policy. The letter didn't say when or why.

And, to end, a caution from the other side of the fence. The Gobbledegook dwells in many places, said McCarthy and Kilpatrick, not the least of which is "in the miasmatic mists of intentional obfuscation." The idea is a simple one: "If you can't convince them, confuse 'em."

A recent study seems to bear out the notion that sometimes it's better to fog up one's text. J. Scott Armstrong rewrote a number of samples of conclusions from learned papers in *Business Management*. There were several versions of each article and they varied, according to the original Gunning index, from very easy to very hard reading. Armstrong then asked a number of faculty members in university Business Administration departments to rate them from "incompetent" to "extremely competent." The readers were not told the names of the journals the original articles were culled

from nor who the authors were. The outcome? The academics rated the *easy* versions of a given article *lower* than the harder ones.

A possible modification of GQ, then, for the intentional obfuscator, is to construct a "Fog It Up Index." I'll leave that, however, as a homework problem for those who need that sort of thing.

## References

"The Gobbledegook" in "A Political Bestiary," Eugene McCarthy and James Kilpatrick, McGraw Hill Book Co., 1978.

"Techniques of Clear Writing," Robert Gunning, McGraw Hill Book Co., 1968.

"Creative Obfuscation," J. Scott Armstrong, IEEE Transactions on Professional Communication, March 1982.

*The program assumes that you have your printer on and ready when it is used. Model I/II users should delete lines 750 and 930 and change all PRINT commands in lines 760 to 920 to LPRINT.*

## Program Listing for GQ

```

10 'GQ — GOBBLEDEGOOK QUOTIENT PROGRAM
20 CLEAR 2000: CLS
30 DEFINT A-Z
40 DIM BW$(100) 'STORAG
E FOR THE BIG WORDS
50 TW=0 'TOTAL NUMBER OF WORDS
60 BW=0 'TOTAL NUMBER OF BIG WO
RDS
70 TS=0 'TOTAL NUMBER OF SENTEN
CES
80 LS=0 'TOTAL NUMBER OF LONG S
ENTENCES
90 PW=0 'PRESENT WORD LENGTH, I
N LETTERS
100 PS=0 'PRESENT SENTENCE LENGT
H, IN WORDS
110 FC=0 'FIRST CHARACTER, 1 IF
UPPER CASE, 0 IF NOT
120 NW=0 '1 AT BEGINNING OF NEW
WORD, 0 IN MIDDLE
130 NS=0 '1 AT BEGINNING OF NEW
SENTENCE, 0 IN MIDDLE
140 LW$="" 'LAST WORD
150 '
160 INPUT "NAME OF ASCII FILE TO BE ANAL
YZED"; FILE$
170 OPEN "I", 1, FILE$
180 '
190 IF EOF(1) THEN 750
200 LINE INPUT #1, SL$
210 IF SL$="" THEN 190
220 N=LEN(SL$)
230 IF N=255 THEN 300
240 C$=RIGHT$(SL$,1)
250 X=ASC(C$)
260 IF X=46 OR X=63 OR X=33 OR X=59 O

```



# WE DIDN'T SAY IT . . .



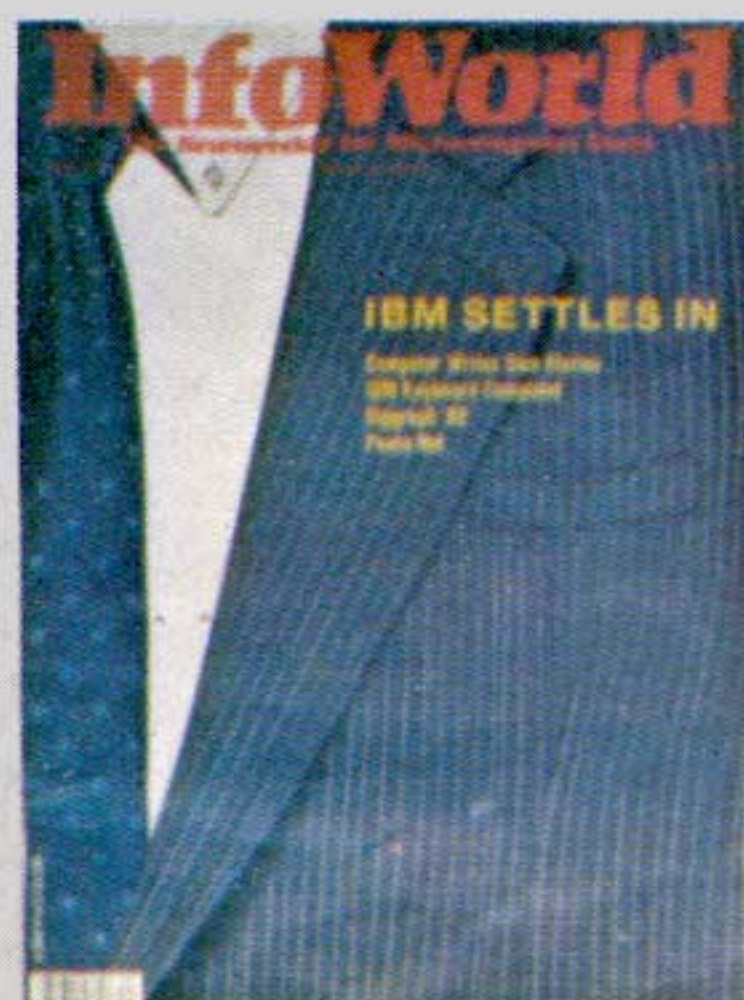
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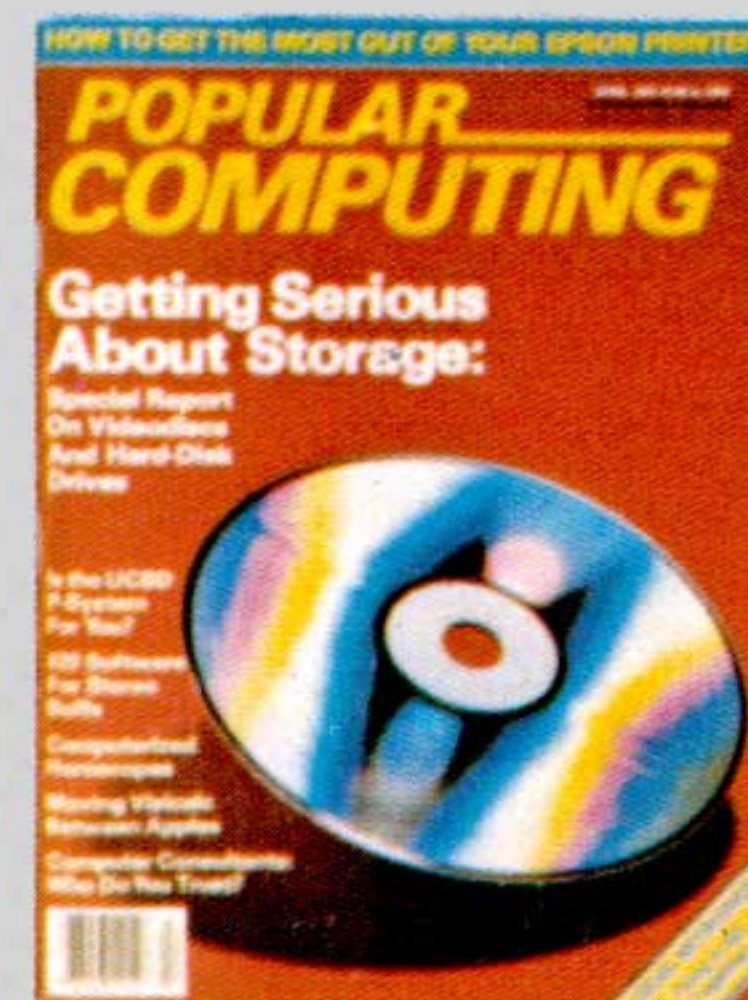
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. . . BUT WE KNEW IT!

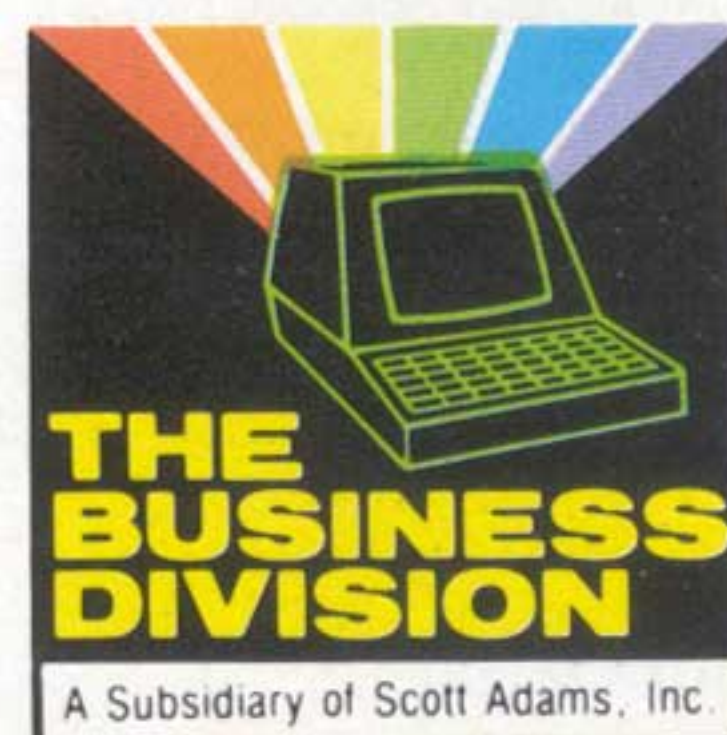


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## What's your GQ?

```

R X=58 THEN GOTO 300
270 'IF SENTENCE-END PU
NCTUATION, THEN JUMP
280 GOTO 190 'NOT A SHORT
SENTENCE, SO IGNORE
290 '
300 FOR I=1 TO N 'LOOP ENDS A
T LINE 650
310 C$=MID$(SL$,I,1)
320 X=ASC(C$)
330 IF X>96 AND X<123 THEN 380
'LETTERS a to z
340 IF X>64 AND X<91 THEN 380
'LETTERS A TO Z
350 IF X>47 AND X<58 THEN 380
'NUMBERS 0 TO 9
360 GOTO 460 'C$ WAS SOME K
IND OF PUNCTUATION MARK
370 '
380 IF NW=0 THEN 420
390 NW=0 'SET NE
W WORD SWITCH BACK TO 0
400 IF X>64 AND X<91 THEN FC=1
'STARTS WITH A CAPITAL
410 IF NS=1 THEN FC=0: NS=0
420 PW=PW+1
430 LW$=LW$+C$
440 GOTO 720
GO ON TO NEXT CHARACTER
450 '
460 IF X=46 OR X=63 OR X=33 OR X=59 OR X
=58 THEN 490 ELSE GOTO 600
470 'SENTENCE-END PUNCTU
ATION: PERIOD, QUESTION
480 'MARK, EXCLAMATION P
OINT, SEMI-COLON, COLON
490 IF PW>0 THEN PS=PS+1
500 IF PS=0 THEN 720
'IGNORE NULL SENTENCE
510 IF PS=1 AND PW<3 THEN 720
DO NOT COUNT TWO-LETTER
520 'ONE-WORD SENTENCES; ASSUME
THEY ARE ABBREVIATIONS
530 IF PS>20 THEN LS=LS+1
WAS IT A LONG SENTENCE?
540 PS=0
550 TS=TS+1
560 NS=1
570 PRINT @ 538, "THROUGH SENTENCE ";
TS
580 GOTO 660
590 '

```

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16727 Patton Detroit MI 48219



```

600 IF X=32 OR X=45 THEN 630 ELSE GOTO
720
610 'SPACE OR H
YPHEN MEANS END OF WORD
620 'IGNORE ALL OTHER (
EXTRANEOUS) PUNCTUATION
630 IF PW=0 THEN 720 'BLANK FOLLO
WING BLANK, NO NEW WORD
640 PS=PS+1
650 '
660 TW=TW+1 'INCREMENT WORD COUN
T, SENTENCE DONE OR NOT
670 NW=1
680 IF FC=1 THEN 700
690 IF PW>9 THEN BW=BW+1: BW$(BW)=LW$
700 PW=0: FC=0: LW$="" 'SET
SWITCHES ETC. BACK TO 0
710 '
720 NEXT I 'GO GET NEXT
CHARACTER IN THIS LINE
730 GOTO 190 'GO GET THE
NEXT LINE
740 '
750 CMD"Z","ON": 'BEGIN TO PR
INT OUT SUMMARY OF DATA
760 PRINT: PRINT "END OF FILE "; FILE$
770 AS=TW/TS
780 PRINT "YOUR TOTAL NUMBER OF SENTENCE
S IS ";TS;"."
790 PRINT "YOUR TOTAL NUMBER OF WORDS IS
";TW;"."
800 PRINT "YOUR TOTAL NUMBER OF BIG WORD
S IS ";BW;"."
810 PRINT "AVERAGE SENTENCE LENGTH IS";
AS; "WORDS";"."
820 PB!=(100*BW)/TW
830 PRINT "THE PERCENTAGE OF BIG WORDS I
S ";
840 PRINT USING "##.#"; PB!;
850 PRINT "."
860 PRINT "THE NUMBER OF LONG SENTENCES
IS"; LS;"."
870 GQ!=0.4*(PB!+AS)
880 PRINT "YOUR GOBBLEDEGOOK QUOTIENT IS
";
890 PRINT USING "##.#"; GQ!;
900 PRINT "."
910 PRINT "YOUR BIG WORDS ARE"
920 PRINT: FOR I=1 TO BW: PRINT BW$(I),:
NEXT I
930 CMD"Z","OFF"
940 CLOSE

```

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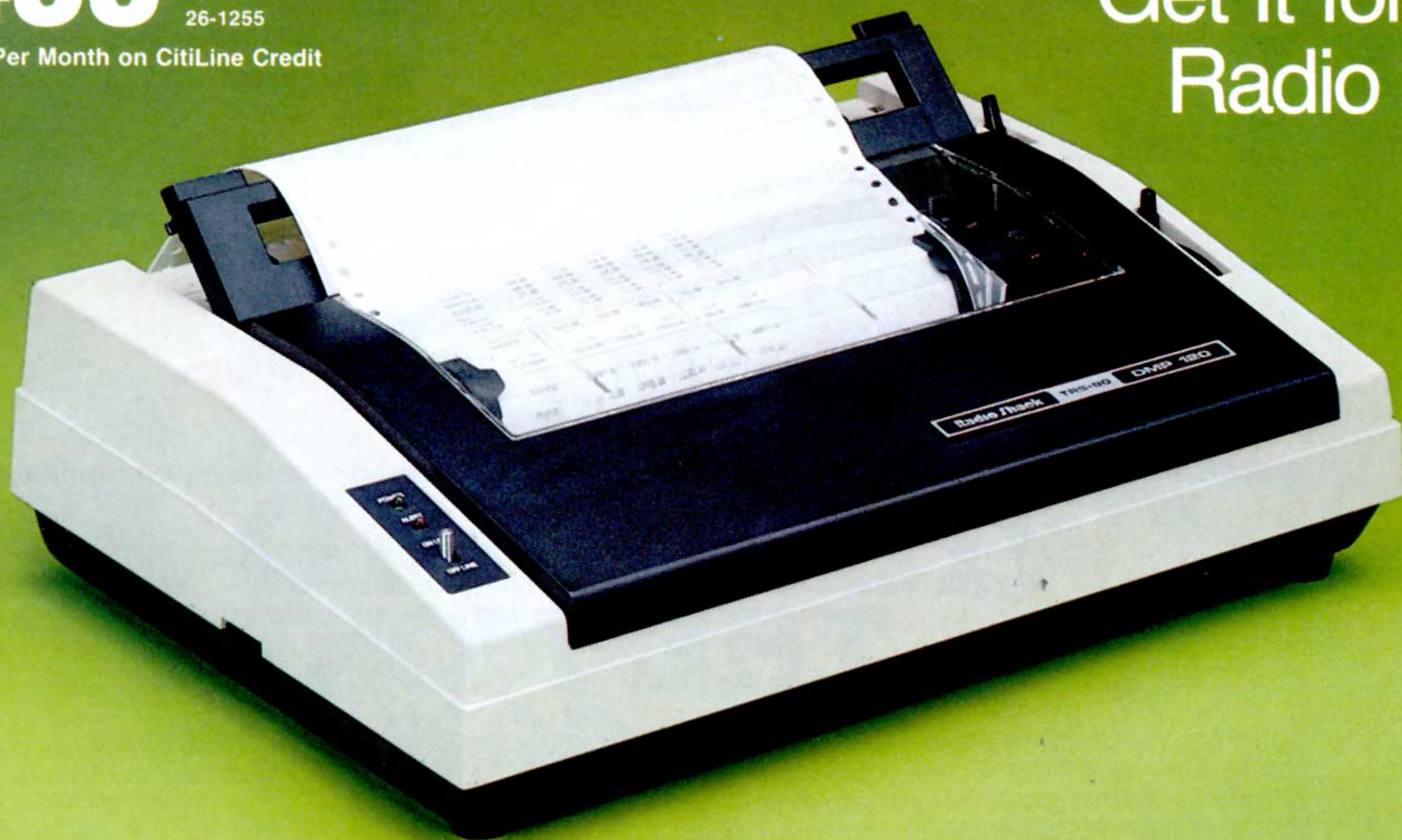
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# BASIC bits

## TRSDOS patches, program renumbering and more . . .

Models I/III

Thomas L. Quindry, Contributing editor

This month's "BASIC bits" column marks my first anniversary of writing for *Basic Computing*. My association with the magazine and the interaction with you, the reader, is something that I will always treasure.

Though it's not stated in the Model III Disk Manual, you can call BASIC programs from TRSDOS 1.3 (and perhaps earlier versions) at the same time you call BASIC. These features are present in other DOS's and, I presume, documented there. You can also set memory size and the number of files.

For example, say you wanted to call a program FILENAME/BAS, which requires two file buffers and saving memory size of 40000. From TRSDOS 1.3, you could use BASIC FILENAME/BAS -F:2 -M:40000. The notation -F:2 stands for two file buffers and -M:40000 instructs memory size above 40000 to be protected. If the number of files and memory size are not specified (i.e., BASIC FILENAME/BAS), the default of three files are reserved and no extra memory is protected except that already protected from the DOS' CLEAR (MEM=xxxx) command. All three commands are optional and may be entered in

practically any order. Some orders of entry are not always reliable, but I have found no pattern to it. Also, if you specify a non-existent program, no error message is given. It usually reboots your disk but you may have to hit reset to get control of your computer if this error occurs.

While I am on the subject of TRSDOS 1.3, here is a little patch that I have come up with. I always cringe at patches which bypass the date and time prompts in DOS. When saving a program to disk, I like to have the proper date show up in the directory. If my DOS bypassed the date/time prompts, I would forget to correct the date before saving a program. After recently reading of someone's patch to bypass these, I decided to write my own patch for TRSDOS 1.3. What I came up with still gives you the prompt. By hitting enter without any other input, you can avoid entering a date and it will be assigned 00/00/00. Or, if you prefer, you can enter the date at the prompt. My patch removes some of the syntax checking that is present. Not that you would want to, but you can put any numbers from zero to 99 for month, day and year. It still will not allow alphabetic characters to be

entered. As before, hitting the enter key at the time prompt without other input allows you to get by without entering a time.

```
PATCH *0 (ADD=4EC1,FIND=F0,
          CHG=07)
PATCH *0 (ADD=4ED4,FIND=
          3A814F,CHG=C3FE4E)
```

At one time, a friend of mine was quite frustrated by not being able to adequately transfer a program which ran under TRSDOS over to another commercial Disk Operating System that he had. He could get the file over to the other system, but it would not run because of some incompatibility. He asked for my assistance. My advice to him is something that you may, or may not, agree with but I will pass it on anyway.

In my opinion, the advantage of getting a more expensive Disk Operating System lies in the ability to use its special functions or advanced BASIC language. Perhaps some of its utilities make life easier. The operating systems available today for the TRS-80 Model I evolved because of the relatively poor performance of even the last version of TRSDOS (2.3) available from Radio Shack. TRSDOS 2.3 is a very minimal



## BASIC bits

operating system. With my limited use, I can see some of the frustration that it has caused its users. Model III owners fared better with TRSDOS 1.3. Though it is not perfect, it is palatable. It is still a relatively simple Disk Operating System, but one can get by quite adequately with its minimum features.

I am not advocating that you don't get a more sophisticated operating system if you feel the need. What I am suggesting is that you keep your mind open and realize that if you have a program that runs properly under TRSDOS, what is the harm in keeping it on a TRSDOS disk? You don't need to change that program over to another DOS just because you have it. If it works with the other DOS, fine! Make the switch if you prefer. If not, it may not be worth going through the frustration of trying to make it work on the other DOS. Obviously, you don't need the special features of the other DOS for that particular program. If you did, it wouldn't work with TRSDOS. Be it a machine language program or a BASIC program, if it works with at least one of your operating systems, don't argue with success.

*Is there any way, in the middle of a BASIC tutorial program, to allow a student to perform certain exercises on his own, to practice some graphic constructions, etc., and then return to the program when he is done practicing?*

—R.M., Santee, CA

Two BASIC commands (STOP and CONT) allow you to do this quite easily. As an example:

```
10 PRINT "Practice Session":  
PRINT  
20 PRINT "To Continue, Enter the  
command, CONT."  
30 STOP  
40 PRINT "Program continues  
here"
```

*I have a Model III, 16K cassette computer. How can I renumber my BASIC programs?*

—H.C., Pollock Pines, CA

There are some very good renumbering programs on the market. Cottage Software has a program called PACKER which not only renumbers BASIC programs, but also will relocate lines and remove spaces and remark statements on command. (*Cottage Software is located at 614 N.*

*Harding, Wichita, KA 67208, (316) 683-4811. Packer sells for \$29.95, Models I or III, tape or disk. —Ed)*

Model III disk BASIC has a renumber utility called by using the NAME command. Radio Shack carries a program called RENUM for the Model I (catalog number 26-2004). It can be modified for use on the Model III as described in the September, 1982 issue of this magazine on page 94.

A simple, do-it-yourself program for renumbering is listed below. Add it as line 60000 to your program and call it by RUN 60000. You will have to have an END statement in your program before that line so that regular running of the program doesn't activate it. This small program will not change GOTO's or GOSUB's. You will have to do that manually. As an aid, add a remark to all lines referenced, as in the example, giving the original line number. Then you can edit your program and make the necessary corrections.

```
4 CLS  
5 PRINT "BASIC Renumber ex  
ample"  
6 PRINT  
10 GOTO 20  
15 PRINT "Nonsense line -  
gets skipped over"  
20 PRINT "This line gets p  
rinted" "Line 20"  
34 END  
60000 A=PEEK(16548)+256*PE  
EK(16549):FOR N%=10 TO 3276  
0 STEP 10:POKEA+2,PEEK(VAR  
PTR(N%)):POKE A+3,PEEK(VAR  
PTR(N%)+1):A=PEEK(A)+256*P  
EEK(A+1):IF(PEEK(A+2)<>96)  
AND (PEEK(A+3)<>234) THEN  
NEXT ELSEPRINT "Renumber  
completed"
```

Remember to send your requests for future column topics, questions and tips to me, care of *Basic Computing*, 3838 South Warner Street, Tacoma, WA 98409. Send a self-addressed stamped envelope and I'll try to give you a personal handwritten reply as long as the answer is not too long and involved. Problems of general interest may be included in a future BASIC bits column.

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---

# Model II disassembler

Peek into assembly language code  
(includes PEEK, POKE and scroll-protect  
routines)

Models II/12/16 using TRSDOS 2.0

J. O'Loughlin, Huron, OR

A disassembler will produce information about machine readable code that can be very useful to a programmer familiar with assembler language programming. This program will produce information that includes both hexadecimal and decimal addresses, ASCII character equivalents, hexadecimal and decimal op codes, and the equivalent Z-80 mnemonics associated with the contents of any requested memory locations. You also have a choice of video or printer output. Figure 1 shows sample input and Figure 2 shows part of the resulting output.

The program depends heavily on material that appeared in three other *80-U.S. Journal* articles; *A Basic Z-80 Disassembler*, by Bill Atchison, Sept/Oct 1980, *Screen Protect for the Model II*, by Jim Crocker, Nov/Dec 1980, and *Notes - Peek and Poke for TRSDOS 2.0 or 2.0a*, May/June 1981. The program presented here will operate as is, but you may find it desirable to order these issues from *Basic Computing* for further understanding. My project consisted of using the essential material from these articles and modifying the existing information in a manner that resulted in a working version of the Z-80 disassembler for use on a Model II with the TRSDOS version 2.0 or 2.0a operating system.

The Model II version performs exactly like the original version in almost every respect. Even original line numbering was preserved almost intact so that it is relatively easy to compare the Model II version to the original which was written for the Model I. The remarks in the program listing offer some details on the conversions which were done.

Patches for PEEK and POKE were applied exactly as they appeared in the *Notes* article. From my own sad experience, be advised that any mistake applying these

patches will cause the program to fail. *Here is a reprint of that information --Ed.:*

## PEEK and POKE for TRSDOS 2.0 (Model II)

The patches for implementing PEEK and POKE on the Model II were sent to us from Belgium. Many thanks to Daniel Lesenne who sent in the information.

Be warned that all eight patches *must be entered* for this modification to work. They replace the OCT\$ and NAME statements of BASIC, so if you need these two commands *do not* make the following changes!

1. Make a fresh backup copy of TRSDOS 2.0 or 2.0a.

2. Build a DO file (pages 2/13 to 2/15 of the TRSDOS section of the Model II Owner's Manual) which reads as follows:

```
PATCH BASIC A=67F3, F=AFCD8761, C=CDDD3  
CD5
```

```
PATCH BASIC A=67F7, F=C5CD7166, C=E72CCDEA
```

```
PATCH BASIC A=67FB, F=E741E753, C=3CD112C9
```

```
PATCH BASIC A=67FF, F=E3011E00, C=CD5D447E
```

```
PATCH BASIC A=6803, F=09444D, C=C3FB3A
```

```
PATCH BASIC A=28FB, F=CE414D, C=D04F4B
```

```
PATCH BASIC A=2A05, F=CF435424, C=D045454B
```

```
PATCH BASIC A=5ADB, F=CD8A4E, C=C3FF67
```

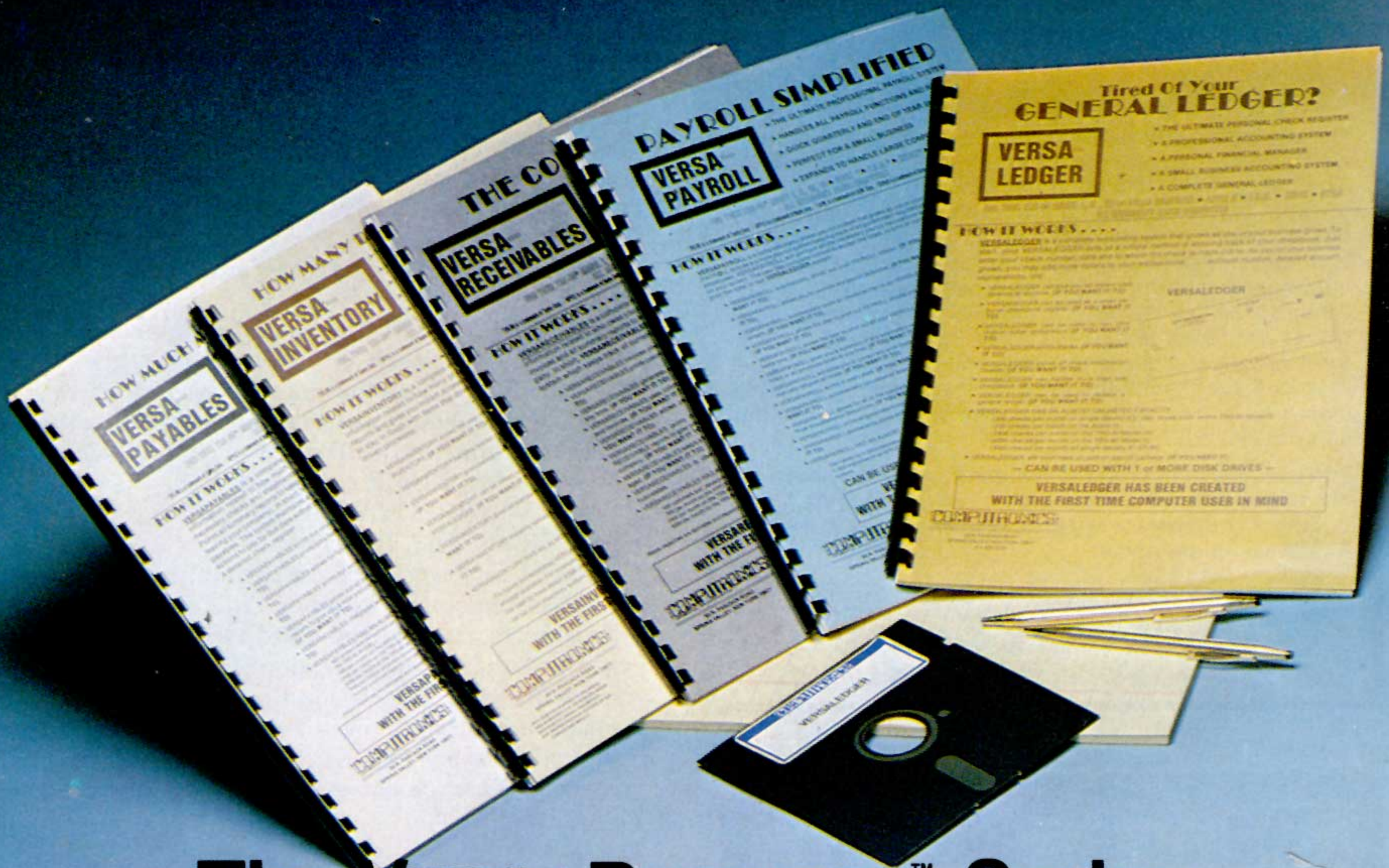
When you are sure that you have no errors in your file, execute the DO file. "Patch is done" should appear eight times. If you see any error message, make note of which patch caused it. You will have to reenter that particular patch by hand from TRSDOS Ready.

At this point, PEEK and POKE should now be a permanent part of BASIC on this disk. PEEK and POKE now have the same syntax as on the Models I/III: PEEK (*memory location*), and POKE *memory location*, *number*. *Number* is any integer in the range 0 to 255. *Memory location* is any integer up to 32767. Locations above 32767 must be converted using the formula: -



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## Disassembler

1\*(65536—desired address). Using PEEK and POKE will open up the world of string and line packing, saving variables between programs and other techniques for the Model II user.

The information given in the screen-protect article was used exactly as detailed except that the code was located at FFA0 through FFA7, instead of F2C0 to F2C7 as in the original article. I then made the appropriate changes in the DUMP addresses to reflect my changes. The correct routine can be entered using DEBUG, beginning at location FFA0 as follows:

1) From TRSDOS Ready, type DEBUG ON. Now type DEBUG.

2) Type M for Modify memory and answer the "A=" prompt with FFA0.

3) Hit the F1 key and type the following code:

```
FE 02 C0 46 3E 1B CF C9
```

4) Hit the F2 key and the changes are now permanent. Get out of the memory examine mode by hitting the ESC key. Hitting the S key will return you to TRSDOS Ready.

Now use this DUMP command:

```
DUMP SCRNPROT/USR START=FFA0, END=FFA7, TRA=FFA7, RORT=R
```

The locations specified places the routine in an area out of any conflict with any other TRSDOS software.

Be sure to refer to the TRSDOS Owner's Manual, pages 2/25 to 2/31, for operation of the DEBUG utility if you are in doubt. The code in lines 2999 through 3030 is the subroutine that invokes the screen-protect program. If you wish to use SCRNPROT/USR in other BASIC programs, it can be accessed with three lines of code:

```
10 CLEAR 1000
20 DEFINT A
30 DEFUSR9=&HFFA0
40 A=USR9(13)
```

The number in parentheses in line 40 determines how many lines are to be protected on the video. For this program it is set at 13. In some cases you may wish to also set a memory size in line 10 to protect the routine from other programs.

With the patched TRSDOS and the SCRNPROT/USR program now ready, the program listed will operate. As one last note, you may have to patch your system to disable address checking. The code to do that is located in lines 10100 through 10240 of the program. Try the program first without them; it may not be necessary.

My Model II version of the disassembler evolved because of my curiosity about SVC's, TRSDOS, and BASIC. The fundamental reason for doing the conversion, writing this article, and offering the converted program is the hope that it will be used by other Model II users to investigate and share information about Model II system software. To help promote the idea, I am prepared to offer the BASIC program, the PEEK and POKE patches in a DO file, the address-checking patches in a DO file, and the file named SCRNPROT/USR on a diskette to interested readers. If you desire a diskette, please send me a brand new and formatted diskette and enough funds to pay for return shipment. Package the diskette well so it can be returned without shipping damage.

I also have a version, requiring no patches, that will work in conjunction with the Snapp BASIC

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## Disassembler

Enhancements (from Snappware, 3719 Mantell, Cincinnati, OH 45236, (800) 543-4628). The same offer to send a diskette applies, but be sure to indicate that you also want the Snapp version and I will add that program as well. In trade, I would like you to share material with me regarding TRSDOS, SVC's, or BASIC by sending it to me. If enough information is received I may be able to compile it into a form suitable for another article in *Basic Computing*.

### Sample Input

```
DO YOU HAVE A PRINTER <YES> OR <NO>? YES
ADJUST YOUR PRINTER TO TOP OF PAGE THEN PRESS <ENTER>?
How many PRINTED lines per page? 60
=====
                Z-80 DISASSEMBLER
=====
HEX STARTING ADDRESS ? 0000      ADDRESS IN DECIMAL : 0
HEX ENDING ADDRESS ? 00F0      ADDRESS IN DECIMAL : 240
PRINT ON-LINE (ENTER YES OR NO)? YES
```

### Partial Listing of Output

MEMORY	ADDRESS	ASCII	MACHINE LANGUAGE	OPCODES	Z-80 MNEUMONICS
HEX	DEC		DECIMAL OP CODE	HEX OP CODE	
0000	0	> \$	62 36	3E 24	LD A, 24H
0002	2	> \$	62 36	3E 24	LD A, 24H
0004	4	> \$	62 36	3E 24	LD A, 24H
0006	6		251	FB	EI
0007	7		0	00	NOP
0008	8	c	195 99 1	C3 63 01	JP 0163H
000E	11		0	00	NOP
000C	12		0	00	NOP
000D	13		0	00	NOP
000E	14		0	00	NOP
000F	15		0	00	NOP
0010	16		201	C9	RET
0011	17		0	00	NOP
0012	18		0	00	NOP
0013	19		0	00	NOP
0014	20		0	00	NOP
0015	21		0	00	NOP
0016	22		0	00	NOP
0017	23		0	00	NOP
0018	24		201	C9	RET
0019	25		0	00	NOP
001A	26		0	00	NOP
001B	27		0	00	NOP
001C	28		0	00	NOP
001D	29		0	00	NOP
001E	30		0	00	NOP
001F	31		0	00	NOP
0020	32	~	126	7E	LD A, (HL)
0021	33		227	E3	ED (SP), HL
0022	34		190	BE	CP (HL)
0023	35	*	35	23	INC HL
0024	36		227	E3	ED (SP), HL
0025	37		194 245 46	C2 F5 2E	JP NZ, 2EF5H
0028	40	#	35	23	INC HL
0029	41	~	126	7E	LD A, (HL)
002A	42	:	254 58	FE 3A	CP 3AH
002C	44		208	D0	RET NC
002D	45	2	195 185 50	C3 B9 32	JP 32B9H
0030	48	1	124	7C	LD A, H
0031	49		146	92	SUB D
0032	50		192	C0	RET NZ
0033	51	3	125	7D	LD A, L
0034	52		147	93	SUB E
0035	53		201	C9	RET
0036	54	E	205 69 201	CD 45 C9	CALL C945H
0039	57		0	00	NOP
003A	58		0	00	NOP
003B	59		0	00	NOP
003C	60		0	00	NOP
003D	61		0	00	NOP
003E	62		0	00	NOP
003F	63		0	00	NOP
0040	64		160	A0	AND B
0041	65		0	00	NOP
0042	66		0	00	NOP
0043	67		0	00	NOP
0044	68		3 6	18 05	JR 004EH
0046	70		8	08	EX AF, AF'
0047	71		0	00	NOP
0048	72		2	02	LD (BC), A
0049	73		9	09	ADD HL, BC
004A	74		0	00	NOP
004E	75		245	F5	PUSH AF
004C	76	R	82	52	LD D, D
004D	77		19	13	INC DE
004E	78		3	03	INC BC
004F	79	1	1 1 108	01 01 6C	LD BC, 6C01H
0052	82		0	00	NOP
0053	83		240	F0	RET P
0054	84	!	1 33 0	01 21 00	LD BC, 0021H
0057	87		0	00	NOP
0058	88		0	00	NOP
0059	89		0	00	NOP
005A	90		0	00	NOP

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# Disassembler

005B	91	0	00	NOF
005C	92	0	00	NOF
005D	93	0	00	NOF
005E	94	0	00	NOF
005F	95	0	00	NOF
0060	96	0	00	NOF
0061	97	0	00	NOF
0062	98	184	E8	CF B
0063	99	U 1 85 3	01 55 03	LD BC,0355H
0066	102	197	C5	PUSH BC
0067	103	213	D5	PUSH DE
0068	104	229	E5	PUSH HL
0069	105	245	F5	PUSH AF
006A	106	175	AF	XOR A
006E	107	! 33 156 0	21 9C 00	LD HL,009CH
006E	110	190	BE	CP (HL)
006F	111	< 40 1	28 01	JR Z,0072H
0071	113	5 53	35	DEC (HL)
0072	114	# 35	23	INC HL
0073	115	190	BE	CP (HL)
0074	116	< 40 1	28 01	JR Z,0072H
0076	118	5 53	35	DEC (HL)
0077	119	# 35	23	INC HL
0078	120	190	BE	CP (HL)

```

80 DISASSEMBLER"+CHR$(13)+STRING$(64,61)
;
110 CLEAR 5000:DEFINT A-J,U,Z:DEFSTR L-T:L
L=CHR$(191):L="0123456789ABCDEF":R="BCDE
HL:A":DI$="-++"
120 GOSUB 5000 : PRINT@540,"" : INPUT"HE
X STARTING ADDRESS ";J$:PRINT @590," ";:
:GOSUB1830:X=K:INPUT"HEX ENDING ADDRESS
";J$:PRINT @670," ";:GOSUB1830:Y=K:IFX>Y
THENPRINT:PRINT"START GREATER THAN END?"
:PRINT:GOTO 120
130 IF VV$="YES" THEN INPUT"PRINT ON-LIN
E (ENTER YES OR NO)";LP$ ELSE PRINT
132 IF LP$="NO" THEN GOSUB 3000
133 'NOV/DEC 1980, 80-US PAGE 74
134 ' SCRNPROT/USR=SCREEN PROTECT FIRST
13 LINES OF SCREEN, SCROLL BELOW
135 IF LP$="YES" THEN SYSTEM "SCREEN" :
LPRINT CHR$(12)
140 PRINT STRING$(64,61) :PRINT"MEMORY A
DDRESS ";CHR$(158);" MACHINE LANGUAGE
OPCODES ";CHR$(158)
150 PRINT "HEX ";CHR$(158);"DEC. ";CHR$(
158);"ASCII";CHR$(158);"DECIMAL OP CODE
S";CHR$(158);"HEX OP CODES ";CHR$(158);"
Z-80 MNEUMONICS"

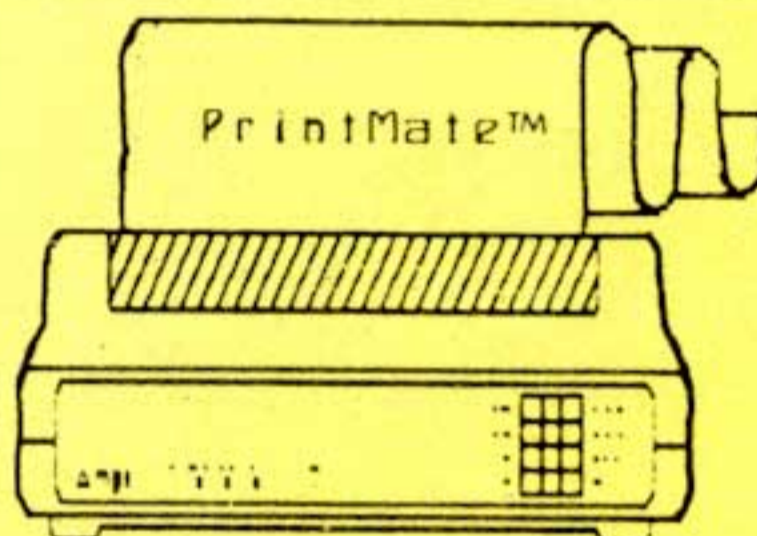
```

## Program Listing for Disassembler

```

1 REM Z-80 DISASSEMBLER SEPT-OCT 1980 80
-US PAGE 33 - DISASSEM/NEW
2 ' SEE DOCS AT PROGRAM END FOR INFO ON
PEEK
3 REM OPERATIONAL 07/12/1982 - LATEST MO
D 8/03/1982
4 REM LINE 625 IS CORRECTION FROM NOV/DE
C 1980 80-US, PAGE 8
90 CLS
100 CLS : CLEAR 1000:PRINT@320,STRING$(6
4,61)+STRING$(24,32)+"
Z-

```



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## Disassembler

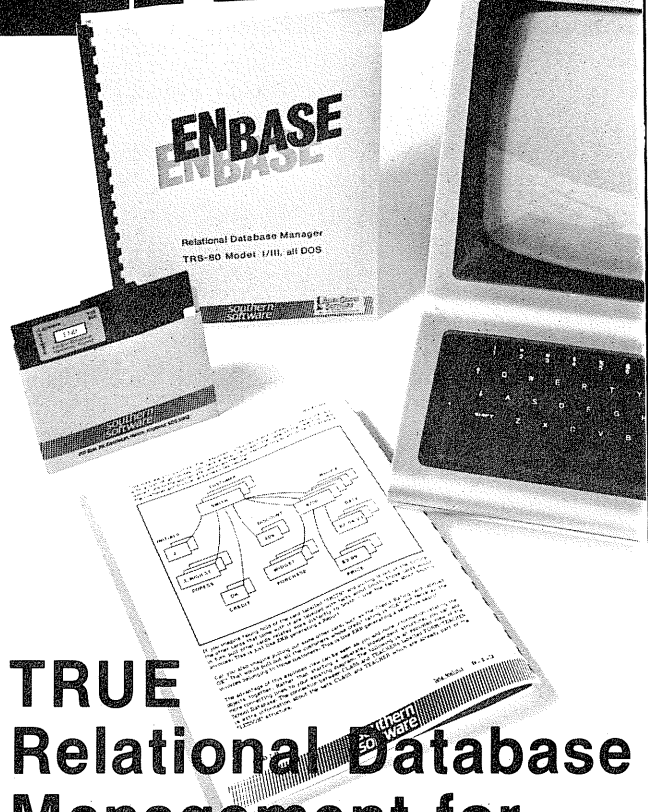
```

160 IF LP$="YES" THEN LPRINT"MEMORY ADDRESS : "TAB(22); "MACHINE LANGUAGE OPCODES : ";TAB(61); "PAGE 1":LPRINT"HEX";TAB(7); "DEC";TAB(13); "ASCII";TAB(22); "DECIMAL OPCODE";TAB(40); "HEX OPCODE";TAB(53); "Z-80 MNEUMONICS"
170 Z=90 : A=VARPTR(Z)
180 REM *** START DISASSEMBLY LOOP
190 FOR V=XTOY:IFV>32767 THEN V1=-INT(65535-V+1) ELSE V1=V
200 IN$=INKEY$:IFIN$="^" THEN 100
210 Z=VAL(STR$(V1)) : A1=OCT$(A+1) : A2=OCT$(A) : A3=OCT$(Z)
220 REM *** GOTO OCTAL SUBROUTINE AND RETURN (B,C,D)
230 I=Z:G=A3:GOSUB480 :A$=Q1:M=""
240 G1=A1:G2=A2:GOSUB500 :Z$=NN
250 REM *** BRANCH ON VALUE OF FIRST OCTAL DIGIT(B)
260 GOSUB 380 : ONB+1GOSUB610,960,980,1080
270 REM *** PRINT ON LINEPRINTER
280 IFLP$<>"YES" THEN 320
290 W1$="":W$="":FORW=IT0Z:W1=OCT$(W):W$=W$+STR$(W1):IFW1>31ANDW1<128THENW1$=W1$+CHR$(W1)+" ":NEXTELSEW1$=W1$+" ":NEXT
293 YL=YL+1 : IF YL>=YY THEN GOSUB 6000 : ' LINE COUNTER
300 LPRINTZ$;TAB(6);V;TAB(13);W1$;TAB(21);W$;TAB(40);A$;STRING$(13-LEN(A$)," ");M : GOTO 350
310 REM *** PRINT ON SCREEN
320 PRINT Z$;TAB(5);RIGHT$(STR$(V),LEN(STR$(V))-1);
330 PRINT TAB(11);"";:W$="":FORW=IT0Z:W1=OCT$(W):W$=W$+STR$(W1):IFW1>31 AND W1<128 THEN PRINT CHR$(W1)+" ":NEXTELSEPRINT "";:NEXT
340 PRINT TAB(17);W$;:PRINT TAB(35);A$;:PRINT TAB(49);M
350 IFZ>=0THENV=ZELSEV=V+ABS(I-Z)
360 NEXTV : GOTO 100
370 REM *** OCTAL CONVERSION SUBROUTINE AND REGISTER COMPUTATION
380 B=(A3AND192)/64:C=(A3AND56)/8:D=A3AND7:C$=MID$(R,C+1,1):D$=MID$(R,D+1,1):IFC$="":THENCS="(HL)"
390 IFD$="":THENDS="(HL)":RETURNELSERETURN
400 REM *** REGISTER PAIR COMPUTATION SUBROUTINES
410 Q=MID$("BCDEHLAF"),C+1,2):RETURN
420 S=MID$("BCDEHLSP"),C,2):RETURN
430 REM *** CONDITION COMPUTATION SUBROUTINE
440 T=MID$("NZ ZNC CPOPE P M"),C*2+1,2):RETURN

```

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October, 1983 57



## Disassembler

```

450 Z=Z+1:G=OCT$(Z):GOSUB 480:A$=A$+" "+
Q1:N1=Q1+"H":RETURN
460 GOSUB 450:A3=G:GOSUB380:RETURN
470 REM *** CONVERT DECIMAL TO ONE-BYTE
HEX (0-255)
480 Q1=MID$(L,((GAND240)/16)+1,1)+MID$(L
,(GAND15)+1,1):RETURN
490 REM *** CONVERT DECIMAL TO TWO-BYTE
HEX (0-65535)
500 G=G1:GOSUB480:NN=Q1:G=G2:GOSUB480:NN
=NN+Q1:RETURN
510 G1=OCT$(Z+2):G2=OCT$(Z+1):GOSUB500:
Q1=NN :Z=Z+2:A$=A$+" "+RIGHT$(Q1,2)+" "+
LEFT$(Q1,2):N1=Q1+"H":RETURN
520 REM *** INSERT (IX,IY) OR (IX+00H,IY
+00H) IN
530 REM *** THE (DD,FD) TWO-BYTE INSTRU
TION GROUP
540 K$=I$:M=M+" ":I$="(HL)":GOSUB1900:IF
J=0THEN 580
550 M1=MID$(M,1,J-1):M2=MID$(M,J+4):M=M1
+K$+M2
560 I$="HL":GOSUB1900:IFJTHENM=M2+K$
570 I$=K$:RETURN
580 I$="HL":GOSUB1900:IFJ<>0THEN590 ELSE
RETURN

```

```

590 P1=LEFT$(M,J-1):IFJ>=LEN(J$)-2THEN60
0 ELSEP2=RIGHT$(M,LEN(J$)-J+2)
600 M=P1+J$+P2 :RETURN
610 ONDGOTO740,760,840,850,860,870,880
620 IFC<2THEN660ELSEGOSUB450:N1%=OCT$(Z)
+1:IFN1%<128THENN1!=Z+N1%ELSEN1!=Z-256+N
1%
625 IF N1! < -32768 THEN N3!=N1! + 32767
: N1!=32767+N3!
630 IFN1!>32767THENN1%=-1*(65536-N1!)ELS
EN1%=N1!
640 G1=OCT$(VARPTR(N1%)+1):G2=OCT$(VARPT
R(N1%)):GOSUB490
650 NN=NN+"H"
660 ONCGOTO670,680,690,700,710,720,730:M
="NOP":RETURN
670 M="EX AF,AF":RETURN
680 M="DJNZ "+NN:RETURN
690 M="JR "+NN:RETURN
700 M="JR NZ, "+NN:RETURN
710 M="JR Z, "+NN:RETURN
720 M="JR NC, "+NN:RETURN
730 M="JR C, "+NN:RETURN
740 IF(CAND1)=0THENGOSUB510:C=C+1:GOSUB4
20:M="LD "+S+", "+N1:RETURN
750 GOSUB420:M="ADD HL, "+S:RETURN

```

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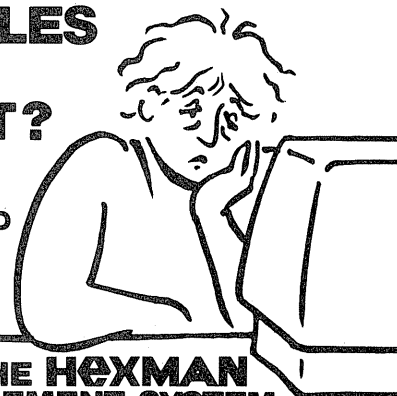
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## Disassembler

```

760 ONCGOTO770,780,790,800,810,820,830:M
="LD (BC),A":RETURN
770 M="LD A,(BC)":RETURN
780 M="LD (DE),A":RETURN
790 M="LD A,(DE)":RETURN
800 GOSUB510:M="LD (" +N1+",HL)":RETURN
810 GOSUB 510 : M="LD HL, (" +N1+" ):RETUR
N
820 GOSUB510:M="LD (" +N1+",A)":RETURN
830 GOSUB510:M="LD A, (" +N1+" ):RETURN
840 IF (CAND1)=0THENC=C+1:GOSUB420:M="IN
C "+S:RETURNELSEGOSUB420:M="DEC "+S:RETU
RN
850 M="INC "+C$:RETURN
860 M="DEC "+C$:RETURN
870 GOSUB450:M="LD "+C$+" ,"+N1:RETURN
880 ONCGOTO890,900,910,920,930,940,950:M
="RLCA":RETURN
890 M="RRCA":RETURN
900 M="RLA":RETURN
910 M="RRA":RETURN
920 M="DAA":RETURN
930 M="CPL":RETURN
940 M="SCF":RETURN
950 M="CCF":RETURN
960 IFC=6ANDD=6THENM="HALT":RETURN
970 M="LD "+C$+" ,"+D$:RETURN
980 ONC+1GOSUB1000,1010,1020,1030,1040,1
050,1060,1070
990 IF B=3THENRETURNELSEM=M+D$:RETURN
1000 M="ADD A, ":RETURN
1010 M="ADC A, ":RETURN
1020 M="SUB ":RETURN
1030 M="SBC A, ":RETURN
1040 M="AND ":RETURN
1050 M="XOR ":RETURN
1060 M="OR ":RETURN
1070 M="CP ":RETURN
1080 ONDGOTO1100,1140,1150,1220,1230,126
0,1270
1090 GOSUB440 :M="RET "+T:RETURN
1100 IF (CAND1)=0 THEN GOSUB410:M="POP "
+Q:RETURN
1110 IFC=1THENM="RET"ELSEIFC=3THENM="EXX
"
1120 IFC=5THENM="JP (HL)"ELSEIFC=7THENM
="LD SP,HL"
1130 RETURN
1140 GOSUB510:GOSUB440:M="JP "+T+" ,"+N1:
RETURN
1150 ONCGOTO1290,1160,1170,1180,1190,120
0,1210:GOSUB510:M="JP "+N1:RETURN
1160 GOSUB450:M="OUT (" +N1+"),A":RETURN
1170 GOSUB 450:M="IN A, (" +N1+" ):RETURN
1180 M="ED (SP),HL":RETURN
1190 M="EX DE,HL":RETURN
1200 M="DI":RETURN

```

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## Disassembler

```
1210 M="EI":RETURN
1220 GOSUB510:GOSUB440:M="CALL "+T+", "+N
1:RETURN
1230 IF(CAND1)=0THENGOSUB410:M="PUSH "+Q
:RETURN
1240 IFC=1THEN GOSUB510:M="CALL "+N1:RET
URN
1250 IFC=5THEN1410ELSEIFC=3THEN1640ELSEI
FC=7THEN 1660
1260 GOSUB980:GOSUB450:M=M+N1:RETURN
1270 G=C*8:GOSUB480:M="RST "+Q1+"H":RETU
RN
1280 REM *** SUBROUTINE TO COMPUTE TWO-B
YTE "CB" INSTRUCTIONS
1290 GOSUB460:IFB<>0THEN1380
1300 ONCGOTO1310,1320,1330,1340,1350,136
0,1370:M="RLC "+D$:RETURN
1310 M="RRC "+D$:RETURN
1320 M="RL "+D$:RETURN
1330 M="RR "+D$:RETURN
1340 M="SLA "+D$:RETURN
1350 M="SRA "+D$:RETURN
1360 M="* * ERROR * *":RETURN
1370 M="SRL "+D$:RETURN
1380 IFB=1THENM="BIT"ELSEIFB=2THENM="RES
"ELSEIFB=3THENM="SET"
1390 M=M+STR$(C)+" "+D$:RETURN
```

```
1400 REM *** COMPUTE "ED" TWO-BYTE INSTR
UCTION GROUP
1410 GOSUB460:ONBGOTO1420,1600:GOTO 1360
1420 ONDGOTO1440,1450,1470,1490,1500,151
0,1530
1430 M="IN "+C$+", (C)":RETURN
1440 M="OUT (C), "+C$:RETURN
1450 IF (CAND1)=0THENC=C+1:GOSUB420:M="S
BC HL, "+S:RETURN
1460 GOSUB420:M="ADC HL, "+S:RETURN
1470 GOSUB510:IF(CAND1)=0THENC=C+1:GOSUB
420:M="LD ("N1+)", "+S:RETURN
1480 GOSUB420:M="LD "+S+", ("N1+)"":RETU
RN
1490 IFC=0THENM="NEG":RETURNELSE1360
1500 IFC=0THENM="RETN":RETURNELSEIFC=1TH
ENM="RET1":RETURNELSE1360
1510 IFC=0THENM="IM 0"ELSEIFC=2THENM="IM
1"ELSEIFC=3THENM="IM 2"
1520 IFM=""THEN1360ELSERETURN
1530 ONC+1GOTO1540,1550,1560,1570,1580,
1590:GOTO 1360
1540 M="LD I,A":RETURN
1550 M="LD R,A":RETURN
1560 M="LD A,I":RETURN
1570 M="LD A,R":RETURN
1580 M="RRD":RETURN
1590 M="RLD":RETURN
1600 IFD=0THENM="LD"ELSEIFD=1THENM="CP"
1610 IFD=2THENM="IN"ELSEIFD=3THENM="OUT"
1620 IFM=""THEN 1360ELSEM=M+MID$("I D IR
DR", (C-4)*2+1,2):RETURN
1630 REM *** SET VARIABLES FOR "DD" DINS
TRUCTIONS
1640 I$="(IX+::)":J$="IX":GOTO 1680
1650 REM *** SET VARIABLES FOR "FD" INST
RUCTIONS
1660 I$="(IY+::)":J$="IY"
1670 REM *** COMPUTE "DD" AND "FD" TWO B
YTE INSTRUCTIONS
1680 GOSUB460:IFG=203THEN 1930ELSEIFG=54
THEN2000ELSEONB+1GOSUB610,960,980,1080:G
OSUB540
1690 GOSUB1900:IFJ=0ANDC<>7THEN RETURN
1700 IFB<>0THEN1740
1710 ONASC(RIGHT$(J$,1))-87GOTO 1720,173
0
1720 M=M+", "+MID$("BCDEIXSP", INT(C/2)*2+
1,2):RETURN
1730 M=M+", "+MID$("BCDEIYSP", INT(C/2)*2+
1,2):RETURN
1740 Z=I+1:A3=FN PEEK(Z):GOSUB 380
1750 GOSUB 450
1760 M="":ONB+1GOSUB610,960,980,1080:GOS
UB 540
1770 I$="::":GOSUB1900:IFJ=0THENRETURN
1780 IFG<128THEND=GELSED=-256+G:G=ABS(D)
```

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```

1790 GOSUB480
1800 SD%=SGN(D):M=LEFT$(M,J-2)+MID$(D1$,
SD%+2,1)+Q1+"H"+MID$(M,J+3)
1810 RETURN
1820 REM *** HEX TO DECIMAL CONVERSION
1830 A=LEN(J$):IFA>4ORJ$=""THENK=-1:GOTO
1870
1840 IFA=4THENH$=J$ELSEH$=STRING$(4-A,32
)+J$
1850 K=0:FORI=(5-A)TO4:J$=MID$(H$,I,1):I
FASC(J$)>=65ANDASC(J$)<=70THENJ=ASC(J$)-
55ELSEJ=VAL(J$):IFJ=0ANDJ$<>"0"THENK=-1
1860 IFJ<0THENK=-1ELSEK=K+J*2^((4-I)*4):
NEXT
1870 IF K<0THENK=0:PRINT"ONLY ENTER HEX"
:INPUT"HEX :";J$:GOTO1830
1880 PRINT "ADDRESS IN DECIMAL : "K:RETUR
N
1890 REM *** INSTRING SUBROUTINE
1900 FOR J=1 TO LEN(M)-LEN(I$)+1:IFI$=MI
D$(M,J,LEN(I$)) THEN RETURN
1910 NEXT:J=0 : RETURN
1920 REM *** TO HANDLE 4-BYTE FDCB AND D
DCB INSTRUCTIONS
1930 GOSUB 450
1940 IFG<128THEND=GELSED=-256+G

```

```

1950 G=ABS(D):GOSUB480
1960 SD%=SGN(D):DD$="("+J$+MID$(D1$,SD%+
2,1)+Q1+"H)"
1970 GOSUB1290:I$=","":GOSUB1900:IFJ=0THE
NI$=" ":GOSUB1900
1980 M=LEFT$(M,J)+DD$:RETURN
1990 REM *** SPECIAL "LD (IX+D),N" AND
"LD (IY+D),N" INSTRUCTION
2000 GOSUB1930:GOSUB480:M="LD "+DD$+" "+
Q1+"H":RETURN
2998 '
2999 ' SCREEN PROTECT ROUTINE
3000 SYSTEM "LOAD SCRNPROT/USR"
3005 ' NOTE: DONT BE TEMPTED TO MAKE THI
S SUBROUTINE A ONE LINER - IT WONT WORK
3010 DEFUSR9=&HFFA0
3020 A=USR9(13)
3030 RETURN
3998 '
5000 ' PRINTER SUBROUTINES
5001 PRINT @1,""
5002 INPUT "DO YOU HAVE A PRINTER <YES>
OR <NO>";VV$
5003 LP$=VV$
5004 IF VV$ <> "YES" THEN RETURN
5010 LPRINT CHR$(12)

```

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## Disassembler

```

5020 INPUT "ADJUST YOUR PRINTER TO TOP O
F PAGE THEN PRESS <ENTER>";XX
5030 INPUT "How many PRINTED lines per p
age";YY
5035 ZZ=1
5040 RETURN
5999 '
6000 ' PAGE HEADINGS
6005 LPRINT CHR$(12)
6007 ZZ=ZZ+1
6010 IF LP$="YES"THEN LPRINT"MEMORY ADDR
ESS :";TAB(22);"MACHINE LANGUAGE OPCODES
:";TAB(61);"PAGE ";ZZ:LPRINT"HEX";TAB(7)
;"DEC";TAB(11);"ASCII";TAB(22);"DECIMAL
OP CODE";TAB(40);"HEX OP CODE";TAB(53);"
Z-80 MNEUMONICS"
6020 YL=0
6030 RETURN
10000 '
10010 ' DOCS
10020 ' USER ROUTINE IS USED TO SCREEN P
ROTECT SCROLLING
10021 ' SCRNPROT/USR - FFA0 THRU FFA7, 8
0-US NOV/DEC 1980 PAGE 74
10025 '
10030 ' LINES 320-340 ORIGINALLY USED PR
INT @ BUT ONLY ONE LINE WOULD

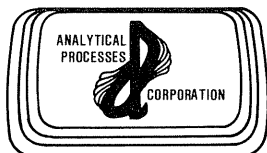
```

```

10040 ' SHOW ON THE SCREEN. CHANGES NOW
ALLOW 11 SCROLLING LINES TO SHOW.
10045 '
10050 ' THE ORIGINAL PROGRAM USED THE GRA
PHIC FIELD SEPARATOR ON EACH LINE.
10055 '
10060 ' THE SCROLL PROTECT WILL REMAIN O
N UNTIL A CLS OCCURS OR A BREAK
10070 ' IS DONE WHEN THE FIRST QUESTION
IS ASKED.
10075 '
10080 ' PEEKS USED IN THIS PROGRAM DEPEN
D ON APPLYING THE PATCHES FOR TRSDOS 2.0
OR 2.0a
10090 ' SHOWN IN MAY/JUN 1981 80-US PAGE
122.
10100 '
10200 ' It may also be necessary to disa
ble address checking - Try
10210 ' the program without the patch FI
RST. If you get an error then
10220 ' apply the following patches.....
10230 ' PATCH SYSRES/SYS A=15A7,F=30DF,C
=0000
10240 ' PATCH SYSTEM/SYS R=2,B=198,F=301
0,C=0000
32767 END

```

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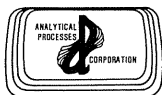
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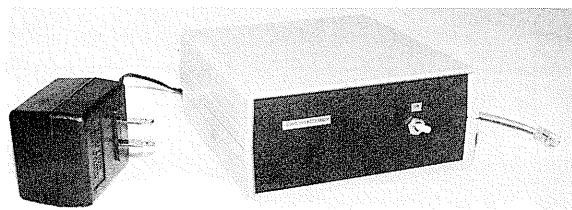


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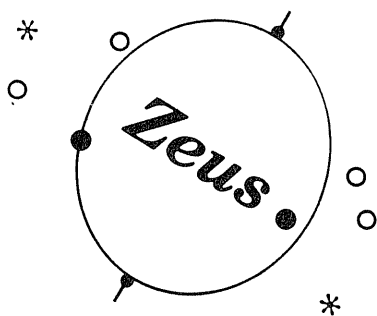
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# Computer ease

## Why I/O and what are all these devices?

For all readers

Mark E. Renne, Bozeman, MT

It's October and "trick or treat" time. I promise no tricks, but lots of treats on keyboards and screens. We'll take a look at the different kinds of each and the advantages and disadvantages of each.

Let me remind you that this column is for beginners and I hope you'll write with your questions about computers. Send a stamped, self-addressed envelope if you'd like a quick response. Remember, no question is too novice for this column.

Let's dig in! This will be our first exploration into INPUT/OUTPUT devices. The input device you'll use most on your computer is the keyboard. Many users buy a computer and later discover that they don't like the feel or layout of the keyboard. Since I assume most of you already own a computer, this discussion should help you in choosing your next computer, or give you a general feel about keyboards.

*What's an ASCII?* ASCII, pronounced AS-KEY, is another of those famous buzzwords that you will come to love. It stands for American Standard Code for Information Interchange. Considering what ASCII stands for, you might get an idea of why abbreviations are necessary. The ASCII standard provides a way to transfer text information from computer to computer.

*What's text information?* Text information is anything in character form. All in all, there are 128 ASCII characters. These include letters (upper- or lowercase), numbers, and

special characters. ASCII numbers are treated as characters and not numbers in the sense of integers. This may sound confusing and you don't really need to completely understand the difference at this point.

*What's this have to do with keyboards?* Thanks for putting us back on track. We had to develop some background in ASCII to discover the differences in Radio Shack keyboards. I mentioned before that the ASCII set, standard for all computers, contains some special characters. Some of the keyboards are unable to produce the entire character set. Also, different types of keys are used on the keyboards.

*What characters are missing?* The Color Computer and the Model III are missing the following: brackets ( [ ] ), backslash ( \ ), caret ( ^ ), underline ( \_ ), braces ( { } ), vertical bar ( | ), and tilde ( ~ ). The Color Computer is also missing a control key while the Model III uses a shift-downarrow to generate control characters. The Models II, 4, 12, 16 and 16B can all generate the entire ASCII set from the keyboard. Several programs for the Model III also allow you to generate the missing characters.

*What's a function key?* Function keys generate a unique value for programmers to use. They allow commands to be executed with one keystroke. For example, Scripsit on the Model II uses function key one, F1, to insert and F2 to delete. Function keys are very handy, but it takes software to make them useful.

*What's a membrane keyboard?*

The most inexpensive type of keyboard (not used in any Radio Shack keyboards), is called a membrane keyboard. This keyboard does not have keys. The contacts are covered by a layer of plastic which is depressed for keystrokes. This is used on the Timex Sinclair and Atari 400 computers. Although inexpensive, this keyboard is difficult for touch-typists to use. However, it's very nice where there's a possibility of something being spilled on the keyboard (e.g., when children are around).

*What's next on the keyboard trail?*

I consider the keyboard on the Pocket Computer series to be high-quality calculator keys. The keys may be arranged in Qwerty order, but they're far too small to be used by a typist. I won't go into depth with these keyboards since they are a specialty item rather than for general computing uses.

*Whoa, what's a Qwerty?* Qwerty refers to the way the keyboard letters are laid out. It gets its name from the first row of letters on the keyboard. This is the standard typewriter layout we all grew to know and love. It's used on all Radio Shack computers. Another type is the Dvorak keyboard. This keyboard arranges the most-used keys together on the keyboard. It's quite a challenge learning to type on a Dvorak keyboard, although some people find it much easier and faster. It's just like my grandmother used to say, "One man's Dvorak is another man's Qwerty." She always was



ahead of her time.

*What's grandma say about "chiclet" keys?* Chiclet keys are used to describe the keyboard of the Color Computer and the new Micro Color Computer. These keys are square, flat, and have a very short throw. Throw refers to the distance the key travels when pressed. This type of keyboard is much nicer than a membrane and about the same price. It's still somewhat annoying to the touch-typist due to the flatness of the keys and the short distance between keys.

*What's left?* The remaining computers all use the standard touch keyboard in one sense or another. The Models II, 12, 16 and 16B all use a standard IBM Selectric typewriter layout. The Models III, 4 and 100 use a slightly modified layout. Radio Shack's keyboards on these models are all excellent in both layout and feel.

Some of the models also have "tactile feedback." This is a system where every time you press a key, a click or tone is heard. This assures

that you actually did press a key far enough for it to register. IBM loves this feature and usually makes it impossible to turn off. Since it drives me crazy to hear those clicks, I look for computers with a tactile feedback switch.

I suggest that before you buy a computer, or your next computer, you take a serious look at the keyboard. You'll spend many hours typing on the keyboard and should get one that feels good to you.

*What's output?* The computer screen is probably where your eyes will be spending many late nights. Screens, of course, come in many different types and require some more computer terms.

*What types of displays are there?* Going from least resolution to greatest, we have the television set, monochrome, low-res color, high-res color, and RGB displays. Resolution refers to the quality and detail of the picture you can obtain from the display. The higher the resolution, the better the display. I'll get to the rest of the terms just a bit later.

*Why not use my television?* First, let me dispel a very ugly rumor. Using a computer, or arcade game, will not hurt your television set. You don't have to worry about "burning in" images or destroying any electronics. It's all perfectly safe when you follow the manufacturer's instructions.

A television is nice to use since it's inexpensive for those who already own one. This is its biggest advantage. The disadvantage is that televisions are low-resolution devices. This means that only a limited number of clearly-defined characters can appear on the screen at one time. A Color Computer shows 32 characters across and 16 lines down (32 x 16) for this very reason. You'll find computers that use televisions are less expensive, but also have lower resolution.

*A monochrome display* has only one color. This is the display built into all the other Radio Shack computers. Perhaps we should call it two colors since there's a color for letters and a background color, most

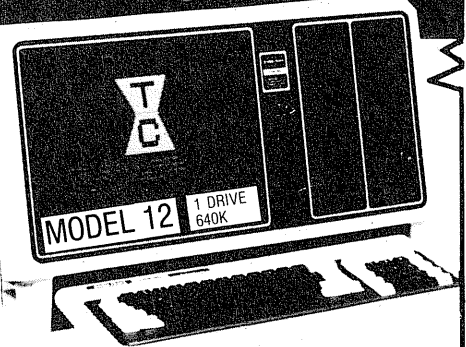
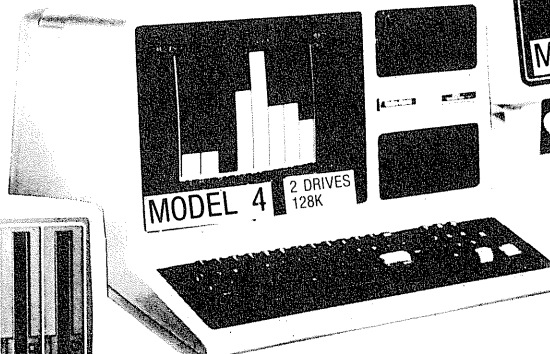
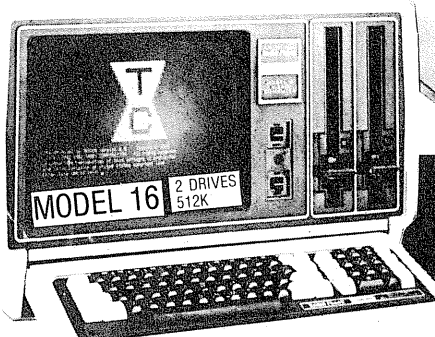
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## Computer ease

commonly black. This means we have something like white, green or orange for the color of the letters. Green and orange are easier on the eyes than white. The more expensive computers use these as standard equipment.

*Color monitors* (different than televisions), are capable of quality resolution and also display colors. *Low-res and high-res* refer to resolution ability. A high-res monitor has much greater resolution than low-res. Pretty simple, isn't it? An *RGB monitor* (red-green-blue) uses three separate inputs to achieve the maximum quality and resolution possible. Monitors vary in price from \$99 to \$1500, as does quality.

*I thought 80 x 24 was the standard screen size.* It is now. When the Model III was introduced, a number of computers used 64 x 16 displays (works out to 1024 characters, or 1K for technical folks) and that's what Radio Shack used. Recent introductions by Radio Shack have all included 80 x 24 screens. If you plan

to do any CP/M (an operating system like TRSDOS) work, an 80 x 24 screen is a must! It really bothers me to see manufacturers claim CP/M compatibility when they have a 24 x 16 screen.

*What's a pixel?* Graphics resolution is usually given in a format something like "X by Y." For example, the Model III has a resolution of 128 x 48; the Color Computer 256 x 192. This gives the number of points, or pixels, that are available for graphics on these computers. This means the Color Computer has higher graphics resolution than the Model III. In other words, a circle looks more like a circle on a Color Computer.

*Why don't all computers use high-res graphics?* First, they're expensive. Second, they use lots of memory. The higher the resolution, the more memory used. Another thing to think about is color. Very high resolution is usually done in two colors (actually one color and a background). Don't believe that you're going to do 256 x 192 graphics

in 16 colors on anyone's computer.

*Can I add hi-res graphics?* Yes, a number of companies, including Radio Shack, offer hi-res graphic boards for the Radio Shack computers. Some companies even offer color for the Model I/III!

My opinion (that's why I started a column, you realize) is that many people gloss over keyboards and screens. I can't think of anything more important on your computer. You'll spend more time cursing or loving your keyboard than any other part of your computer. If you want a good reason not to buy a \$49.95 computer, type on one for six hours and then type on a Model III. I think you'll see the difference. Don't be fooled by large keys either. Some computers use large keys but still feel lousy. My advice is "type it for yourself, honey."

Well, that's it for this month. Remember that computers should be fun and understanding them is easier than you may think. Keep those cards and letters coming in. Happy computing.

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# Exploring VisiCalc

## DIF isn't so difficult: Part I

Models I/II/III

Timothy K. Bowman, Contributing editor

During many of the past columns and reviews I have mentioned the term DIF. DIF, an acronym for Data Interchange Format, is Software Arts, Inc.'s standard format for the interchange of data between VisiCalc and any other program capable of recognizing and using DIF formatted data. In fact, the access by various types of micro-computer hardware and software (including BASIC, machine language, or any other programming language) to a common data base or information is one of the significant issues of microcomputing today. No one likes to re-enter information through the keyboard any more often than is necessary.

Examples abound as to how data saved in a DIF format can make each of our jobs easier. Two common examples from my everyday use are the transfer of VisiCalc files to graphics or text processor programs. Others include the capture of the data through measurement instruments and storage of that information in the DIF format which can be later read by VisiCalc or a BASIC program, transmitting of DIF files between two different brands of computers using data communications capabilities, or transfer from a data base such as Profile III+ to VisiCalc (a subject of a future column).

Before I describe in some degree of detail how DIF works and how to begin to use it, let me share with you some things it does not do. The key thing to remember is that DIF will not transfer formulas between VisiCalc files unless those formulas are part of a label (surrounded by quotes). As the name states, the DIF format is used for the exchange of data. Once a file is saved in the DIF

format and subsequently reloaded, only the values produced by that file are actually saved and reloaded. If this doesn't seem clear, please be patient. It should become clearer as we progress.

DIF does not provide for any of the housekeeping details that files stored in VisiCalc format do. Examples of these items are storage of the cursor location, recalculation mode, titles or split windows. You have probably already noticed that files saved in the VisiCalc format reload exactly as they were saved, right down to the cursor location. All that the DIF storage format accomplishes is to save the results.

DIF storage allows for the storage of portions of the spreadsheet, while VisiCalc storage does not. Theoretically and practically, this reduces the potential file sizes if you are only concerned with storing a portion of the spreadsheet you have just created and are not concerned with saving the formulas.

### Getting Started

In order to explain how DIF works, create the simple income statement shown in Figure 1. I've kept it quite simple to illustrate what DIF can and cannot do. After you have created it in VisiCalc, save it to a diskette in the conventional manner (/SS) using the name INCOME (and a drive specifier if you desire). If you look at a directory of the diskette you just saved the file to, you'll notice that the program automatically tacked on a "/VC" so the name now reads INCOME/VC. It's that suffix that allows the VisiCalc program to recognize the file as a VisiCalc-formatted file.

Now let's save the above spreadsheet in DIF format. Position

the cursor in position A1 and type /S#S INCOME (with a drive specifier if desired). In response to the prompt Data save: R C or ENTER, press ENTER and position the cursor down in position F23 (or simply type F23 on the command line before moving the cursor). If you look at this file on the diskette directory, the program automatically added the "/DIF" and the name is now INCOME/DIF.

Now let's do some exploring. First, clear your spreadsheet (/CY). Then load the file INCOME/VC. You should see exactly what is shown in Figure 2. Position the cursor in position A10 and load the second file using the DIF method (/S#L INCOME/DIF ENTER). The VisiCalc program added the second file to the bottom of the first, starting at cursor position A10. However, the cell contents displayed below A10 are simply data values. Of course, we have also overwritten the bottom portion of the original spreadsheet.

Clear the spreadsheet again and this time load the DIF file first using the command sequence (/S#L INCOME/DIF ENTER). Position your cursor at position A10 again and load the regular VisiCalc file (/SL INCOME/VC). After it loads, try to find your DIF file. It's gone and has been replaced by the formulas contained in the regular file.

What should this be telling you? Any file saved in VisiCalc format (/SS) is reloaded in exactly the position it was created and overwrites whatever is there. Conversely, the data in a file saved in DIF format (/S#S) is reloaded starting at the cursor's position just before the loading of that file. It, too, can be used to overlay a file and can



## Exploring VisiCalc

in fact be used as a very effective mass spreadsheet blanking device. See the last Exploring VisiCalc column (August, 1983) for a description of that technique.

One other thing to remember: When the prompt comes up to press

"RC or ENTER," I urge you to press ENTER until you are completely confident of your DIF handling ability. If you happened to save the file by pressing ENTER and subsequently reload it by pressing C, please don't write me asking how

to unscramble it. Try it on an unwanted file if you don't believe me.

### Homework

Try experimenting with DIF by saving and reloading some of your conventional files in the DIF format. Become comfortable with it. Next month, we'll conclude our discussion of DIF by demonstrating how to access and manipulate your VisiCalc files from BASIC. Included will be a BASIC program to read and re-arrange a DIF file, and then write it back out to a diskette.

Finally, perhaps you have a favorite way in which you have used DIF and would like to share it with other users. If so, please write to me in care of *Basic Computing*.

### Lazy Writer, Farms and VisiCalc

Mr. Mark Wilsdorf recently sent me a series of Lazy Writer word processor X-Key sequences which allow for manipulation of VisiCalc files. Examples of these manipulations include inverting the order of

**Figure 1**

This is the cell content of ART1083/VC:1:

	A	B	C	D	E	F
1			"Sample Co	"mpany		
2		" I	"ncome Sta	"tement		
3		"For the T	"hree Year	"s Ended D	"ecember 3	"1, 1983
4						
5			1981	1982	1983	
6			" -----	" -----	" -----	
7	"Sales		45000	53950	100000	
8	"Cost of S	"ales	.45*D7	.46*E7	.42*F7	
9			" -----	" -----	" -----	
10	"Gross Mar	"gin	+D7-D8	+E7-E8	+F7-F8	
11						
12	"Expenses:					
13	" Wages		12000	17000	34000	
14	" Telepho	"ne	1300	1500	2500	
15	" Travel		5012	3392	8403	
16	" Utilitie	"es	600	600	600	
17	" Legal &	" Accounti	3249	5400	6000	
18		"Total Exp	"enses	@SUM(D13...D17	@SUM(E13...E17	@SUM(F13...F17
19						
20	"Income Be	"fore Taxe	"s	+D10-D18	+E10-E18	+F10-F18
21	"Taxes			/F1+D20*.22	/F1+E20*.22	/F1+F20*.22
22	"Net Incom	"e		/F1+D20-D21	/F1+E20-E21	/F1+F20-F21
23				" =====	" =====	" =====

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the VisiCalc listing (powerful!), deleting labels, deleting unnecessary characters at the end of the VisiCalc file, etc. If you are using Lazy Writer and VisiCalc, write to me, enclosing a stamped envelope, and I'll send you the entire list of commands.

If you are a farmer who uses VisiCalc, Mr. Wilsdorf is also the editor of *AgriComp*, the Reference for Farm Computing. Judging by the issue I received, it is filled with all types of examples of how to use VisiCalc for farm applications. For further information, contact Mr. Wilsdorf in care of *AgriComp*, 103 Outdoor Building, Columbia, Missouri 65201.

### Model 4 VisiCalc and Multi Plan

Yes, there is even some software available for the new Model 4 running under TRSDOS 6.0. I have test versions of VisiCalc and Multi Plan that run on my Model 4. I am awaiting copies of the final user documentation in order to complete a

formal review. If you would like some informal comments based upon several months' use, write to me in care of *Basic Computing*. Please include a stamped, self-addressed envelope for a reply. See

you next time.

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**Figure 2**

Sample Company  
Income Statement  
For the Three Years Ended December 31, 1983

	1981	1982	1983
Sales	45000	53950	100000
Cost of Sales	20250	24817	42000
Gross Margin	24750	29133	58000
Expenses:			
Wages	12000	17000	34000
Telephone	1300	1500	2500
Travel	5012	3392	8403
Utilities	600	600	600
Legal & Accounting	3249	5400	6000
Total Expenses	22161	27892	51503
Income Before Taxes	2589	1241	6497
Taxes	570	273	1429
Net Income	2019	968	5068
	=====	=====	=====

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# CP/M 68K

## Putting CP/M to work on the Model 16

Model 16

Jim Bombardier, Kalama, WA

Have you been wondering if *Basic Computing* had any Model 16 reviewers? Well, they do, but until recently there has not been any software for the Model 16 worthy of a published review. I have owned a Model 16 since August, 1982 and have been as anxious as other Model 16 owners about the lack of single- or multi-user operating systems, languages and application programs that utilize the MC68000 chip. It is less than comforting to know that the original Model 16 isn't made anymore and all original Model 16 owners must pay, who knows how much, to acquire the enhanced keyboard and the expansion chassis that are standard on the Model 16B. I think Tandy ought to treat the customer who invests five to ten thousand dollars in their equipment better than they treat a customer who buys something like the Color Computer. Enough said.

Before reviewing CP/M-68K, a brief introduction of myself is in order. I am a private consultant/analyst/programmer in the mini/microcomputer arena. Recent work experience includes installing a multi-user, all-encompassing wholesale/retail application system and training the customer staff on a TI-990; designing, developing, and installing a menu-driven, 50-program, multi-user log management and export application system on a DEC 11/23 written in Pascal and running under RSX-11M. My early data processing experience with Weyerhaeuser and Washington State government varied from operations to system analysis on mainframes. My experience of any significance with micros has been with Apple, IBM, and TRS. I do limited assembly language pro-

70 Basic Computing

gramming and have varying degrees of experience with COBOL, FORTRAN, BASIC and Pascal. I am currently teaching myself "C" and reading about UNIX (the operating system developed in conjunction with "C").

### CP/M-68K

As the name suggests, this version of CP/M is meant to be compatible with various hardware systems utilizing the Motorola MC68000 chip. This is the 16-bit chip of the TRS Model 16/16B that can also be added to the TRS Model II and Model 12 machines. CP/M-68K has been customized for these machines by Trisoft of Austin, Texas.

This release is significantly different from the standard Digital Research CP/M-68K because Tandy incorporated the Z-80 into the architecture either to run separately or to perform all the I/O for the 68K processor. The user must have, or purchase, a version of CP/M to run on the Z-80 (more on this later). Trisoft sells the complete package, including Pickles & Trout CP/M 2.2 and CP/M-68K for \$555. If you already have a Z-80 CP/M, the price for just CP/M-68K is \$395.

This all works a whole lot easier than it may sound. Once both CP/M's are up, users can switch quickly back and forth between the two. The documentation that comes with CP/M-68K consists of a large four-manual, 3-ring book from Digital Research and another smaller manual from Trisoft that discusses installation, special features and quirks of the Trisoft customized version. The package comes on six single-sided, single-density diskettes that include the Motorola version of the MC68000 assembler and a "standard" version

of the "C" language.

Let me take a moment and summarize the Tandy MC68000/Z-80 architecture and interface, as more fully described in the Trisoft manual. Figure 1 shows the internal structure of a minimum-configured Model 16 that includes a 4-megaHertz Z-80 processor with 64KB of RAM and a 6.6-megaHertz MC68000 processor with 128KB of RAM. Figure 1 shows that Tandy chose not to connect any I/O ports directly to the 68K processor but, instead, created (in hardware) a "window" through which the Z-80 processor may examine and, if desired, alter the contents of 68K memory. This gives the 68K processor an indirect method of accessing external I/O ports and devices, with the active cooperation of the Z-80. The Z-80 "looks" into the 68K memory, deciphers what I/O is desired and performs the operation itself. This frees the more powerful 68K processor for those tasks for which it is better suited.

The other information that Figure 1 shows is the memory layout for both CP/M-80 and CP/M-68K. Two differences exist between the two operating systems. First is a 1024-byte "hardware exception table" that points to functions to be performed whenever certain abnormal or unusual conditions occur. The second difference is in the usage of the CCP region (and, in some cases, the BDOS as well) as part of the TPA. This tactic slows down warm-boot returns from programs to the CCP (because the CCP must be read back in from disk) and is not worth the small amount of memory saved with the 68K, where memory is less of a problem.

Tables 1 and 2 show the built-in and transient utility commands that



are available with CP/M-68K.

## BDOS

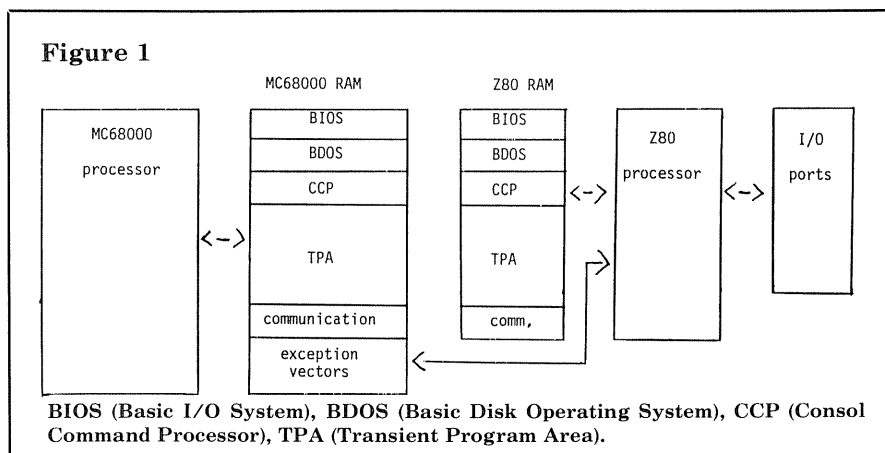
The CP/M-80 BDOS functions are an almost exact subset of those for CP/M-68K. I assume readers are familiar with BDOS functions up through number 36, so Table 3 summarizes only BDOS functions above 36 that are available with CP/M-68K as well as other special functions which Trisoft supports. (BDOS functions zero through 36 are standard disk I/O calls on all versions of CP/M. —Ed) CP/M-68K does not support keyboard typeahead even though the Z-80 CP/M may support it.

## BIOS

Since all the I/O is executed through the Z-80 BIOS, the 68K BIOS is automatically configured during startup to support the CP/M-80 BIOS it will work through. Depending on the particular CP/M-80 you have, you may have to go back to the Z-80 CP/M and then back to the 68K CP/M to get the system to recognize diskettes with different densities or formats.

## Installing and Running CP/M-68K

The installation of CP/M-68K on a system with a Z-80 CP/M is very simple. It consists of inserting the proper diskette from the Trisoft release into drive B and entering a SUBMIT command that moves a number of files to the Z-80 system



disk. To run CP/M-68K, the user must enter a command in Z-80 CP/M mode to bootstrap the CP/M-68K loader into MC68000 memory. (This only needs to be done during power-up or reset.) After loading the bootstrap, both operating systems are available. The 68K version is obtained by entering M68 and the Z-80 by entering Z-80. It is quick and easy to switch back and forth.

CP/M-68K, as provided by Trisoft, is configured to run in 128KB of MC68000 memory. Trisoft provides a custom installation program called "sizer," which lets the user modify the amount of MC68000 memory that the operating system operates within and the two sets of memory management registers that can be used to partition memory. Since I have 384KB of memory, I used the sizer program. It seemed to

perform just as described.

## Performance and Ease of Use

It was mentioned earlier that CP/M-68K from Trisoft comes with an assembler that is compatible with the assembly language defined by Motorola. The assembler that comes from Tandy with the Model 16 was developed according to IEEE mnemonics and standards, and is licensed to Tandy by Ryan-McFarland. I certainly don't know enough about either MC68000 assembly language to recommend one over the other. What I do know is that the Tandy/Ryan-McFarland assembler took about 10 times as long as the CP/M-68K assembler to assemble what I thought were comparable assembly language instructions.

The Trisoft release of CP/M-68K also comes with the "C" language,

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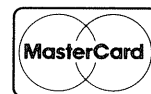
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## CP/M 68K

based on the Portable C Compiler (PCC) written by Stephen C. Johnson. The C compiler that comes with the 68K release is a three-step/pass compiler that produces assembly language source code. It can then be assembled and linked to form a program. The most significant difference between the PCC and the 68K C language is the lack of support for floating point numbers. I have been told that this shortcoming will be rectified soon. By the time that you read this, there will, no doubt, be a number of other languages available under CP/M-68K.

A benchmark that I was able to run under CP/M-68K using C was the Sieve of Eratosthenes. The January, 1983 issue of *Byte* reported a list of almost 200 processor/language combinations and the corresponding speed at which they were able to process the same prime number program. The speeds they listed ranged from .0078 seconds in assembly language on Big Blue's 3033 to 5740 seconds in RMCOBOL

on a XEROX 820. The fastest speed listed for a Tandy machine was 190 seconds, using MMSFORTH 1.9 on a Model I. The speed listed for the Model II, running under TRSDOS with MBASIC, was 2250 seconds

Before I tell you about the speed of the 68K, I want to make sure you understand that this benchmark is only one of many measurements of the power of a processor/language combination. The feature of this program is that it avoids multiplication and division because these operations are usually slow, especially in computers that do not have native instructions for these operations. Okay! Okay! Nine seconds on the Model 16 under CP/M-68K in C. That puts it right in there with the reported speed of the MC68000 processor/language combinations in the *Byte* article. Most of those listed were 8 megaHertz processors, and the Model 16 68K chip is rated at 6.6 megaHertz.

I also obtained a Compiler BASIC from *Basic Computing*. It was developed by Mr. Bill Stockwell, 777

SE 15th, Apt. 310, Edmond, OK 73034 (405)348-7078. It is written for operation under TRSDOS-16, versions 4.1 or 4.2 and CP/M 68K. TRSDOS-16 is the original 68000 operating system that Radio Shack sells with the Model 16. The Sieve program (Listing 3) was written in MBASIC, compiled, and took 56 seconds to run. Note that this version of BASIC supports WHILE . . . WEND syntax. The compiler is available for \$50. Interested readers should contact Mr. Stockwell for more information.

The only other programs that I wrote in C were a simple calculator program (the C language doesn't yet support floating point numbers) and a shell sort program that sorted 10,000 random integers in 20 seconds. The program listings used are given at the end of this article.

### Summary Ramblings

I was not able to exhaustively test, or even try, all of the features of CP/M-68K, but I like what I have seen of it. The flexibility of switching back and forth between systems

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Table 1

## Utility Commands

DIR	Displays filenames of files marked with the DIR (DIRectory) attribute in the directory.
DIRS	Displays filenames of files marked with the SYS (SYStem) attribute in the directory.
ERA	Erases a file from the disk by removing the filename from the directory and by releasing the storage space occupied by the file.
REN	Renames a disk file.
SUBMIT	Executes a list of commands contained in a SUBMIT file created by the user. <i>Note:</i> CP/M 68K does not require that the user enter SUBMIT to execute a command file. If the user enters just the command file name, the system first will look for a program file with this command keyword as its name and 68K as its filetype. If it does not find a match, the system changes the filetype to "blank" and then to SUB before giving up.
TYPE	Displays contents of an ASCII (character) file on the screen.
USER	Changes to a different user number.

Table 2

## Transient Utilities

AR68	Stores object files in the C run-time library, the archive utility.
AS68	Invokes the assembler.
C	Invokes a submit file for calling the C language compiler.
C068	Intermediate compiling step for the C language.
C168	Intermediate compiling step for the C language.
CP68	Invokes the C language preprocessor for processing macros.
COPY	Copies disks (including CP/M-68K boot disks). <i>Note:</i> This is a "track-to-track" diskette copy pro-

gram and cannot copy protected boot tracks, but FILES option can be used to copy files. If you have a Z-80 CP/M that doesn't allow density reselection from a running program, programs running under CP/M-68K can't either.

DDT	Invokes DDT™, the CP/M-68K debugger.
DUMP	Displays a file in ASCII and hexadecimal formats.
ED	Creates and alters character files. <i>Note:</i> User may open file on one drive and direct edited material to a file on another drive.
FORMAT	Marks all disk sectors with the appropriate density and length. <i>Note:</i> Because the Z-80 does all the I/O, the user must use the formatting programs supplied by the Z-80 CP/M vendor.
INIT	Prepares a disk so that it

L068	Invokes the linker.
NM68	Invokes the NM68 utility that prints the symbol table.
PIP	Copies, combines, or transfers specified files between peripheral devices.
RELOC	Changes a program's load address to be absolute.
SEND68	Converts a program file to the Motorola S-record format.
SIZE68	Prints the size of a program file.
STAT	Shows the access status for disks or files, the amount of free space on disks, the space occupied by files, or the logical-to-physical assignment of devices, according to options specified in the command line.

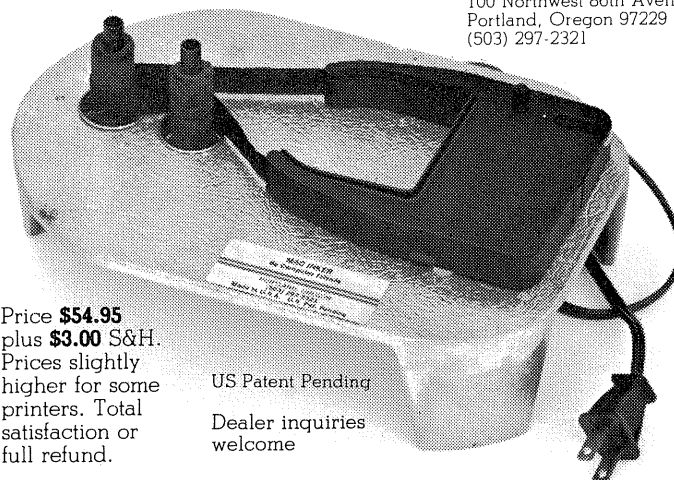
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Listing 1—Eratosthenes Sieve Program in the C Language

```

/*Eratosthenes Sieve Prime # Pgm in C*/
#include <stdio.h>
#define TRUE 1
#define FALSE 0
#define SIZE 2190
  chr flags[SIZE + 1];
main () {
  int i,prime,k,count,iter;
  printf("10 Iterations\n");
  for (iter = 1; iter <= 10; iter++)
    count = 0;
    for (i = 0; i <= SIZE; i++)
      flags[i] = TRUE;
      for (i = 0; i <= SIZE; i++) {
        if(flags[i]) {
          prime = i + i + 3;
          for(k=i+prime; k<=SIZE; k+=prime)
            flags[k] = FALSE;
          count++;
        }
      }
      printf("\n%d PRIMES ",count);
}

```

is a real plus. It is now a single-user operating system, but you can bet that as sophisticated applications are developed for 68K, their creators will have a spooler, semi-disk or other activities going on in other definable-memory partitions. The folks at Trisoft have been very helpful. They were prompt when a question came up that required more in-depth study and have been very willing to discuss the various aspects of their system, CP/M, and the Model 16 in general.

The documentation is written more as a series of reference manuals than as tutorials. Except for the user's guide manual, it is definitely not aimed at the novice computer user. This is not a criticism — it's a statement. Trisoft does provide tutorial-type installation and customization instructions. The user's guide manual from Digital Research is considerably easier to read and understand than previous Digital Research documentation.

I used the 68K text editor (ED), but I have been too spoiled by the full-

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- Single keystroke insertion/deletion of character or line. Scrolling by line or page - up or down. Scrolls at the rate of 20 lines per second. Scrolls also page by page (15 lines to a video page). Scrolling will wrap around to the top or bottom of the buffer. Enter the line number and jump to that line in the buffer.
- Set tab positions as on a typewriter. Bidirectional tabbing. Underline, expanded characters, control character pitches, enhanced type, condensed type, intermix printer controls including right justify, margins, etc. within a line. User-definable headers and page numbers.
- User-definable left margins, line length (3 to 255), page length, and form length. All imbedded within the text for dynamic printer control.
- Upper/lower case printout (on printers that accept lower case) even on computer videos that don't display lower case.
- Dynamic printer control of margins, line length, type size, fonts, page length. The dynamic control of the margins will allow indenting so that outlines may be printed and still be properly right justified. Permits embedding ASCII printer commands into the text.
- Save printer control codes to be used and applied to defined mnemonics. Prints text to nearest word or right justifies. User can control right margin. Printout lines with lengths of up to 255 characters.
- Block load and insert or append. Block or total save to user specified files. Exit program to issue DOS commands and then return to the text intact.
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screen editors on the DEC and TI systems to consider ED for extended use. Now that I have CP/M, my sophisticated text processing options have expanded. Another plus to CP/M-68K is that I don't have to have a hard disk to run it as you do with TRS-XENIX. I'm sorry, Tandy, but the flexibility of having easily-switchable access to both 8- and 16-bit CP/M operating systems may sell a lot of machines, but it will have a significant detrimental effect on software sales. It will be interesting to see how the multi-user competition evolves on the Tandy machines between Digital Research and Microsoft. Will concurrent CP/M and/or MP/M be developed for the Model 16? I'm hedging my bets and still studying up on UNIX and C.

*Trisoft is located at 4102 Ave. G, Austin, TX 78751, (512) 445-5580. They offer the CP/M-68K for installation on numerous Model 16 hardware and Z-80 CP/M configurations. Readers should contact them directly for details. —Ed*

### Listing 2—Shell Sort Program in C Language

```

/*Shell Sort Program in C*/
#include <stdio.h>
main ()
  int seed,rnum,gap,i,j,n,temp,v[10000];
  seed = 48;
  rnum = srand(seed);
  n = 10000;

  for (i = 0; i <= n-1; i++) {
    v[i] = rand();
  }
  printf("start sort\n");
  for(gap = n/2; gap > 0; gap /= 2)
    for(i = gap; i < n; i++)
      for(j = i-gap; j>=0&&v[j]>v[j+gap];j-=gap){
        temp = v[j];
        v[j] = v[j+gap];
        v[j+gap] = temp;
      }
  printf("stop sort\n");

  for(i = 0; i <= n-1; i++) {
    printf("%8d", v[i]);
  }
}

```

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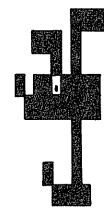
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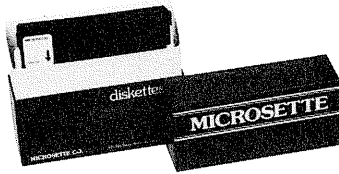
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## CP/M 68K

### Listing 3—Sieve of Eratosthenes Prime Program in MBASIC

```

5 REM The Prime Number Program in MBASIC
10 DIM I,M,COUNT,PRIME,PART,K,J,FLAGS(8191)
20 PRINT "10 Iterations"
30 FOR M = 1 TO 10
40   COUNT = 0
50   FOR I = 0 TO 8190
60     FLAGS(I) = 1
70   NEXT I
80   FOR I = 0 TO 8190
90     IF FLAGS(I) = 0 GOTO 180
100    PART = I + I
110    PRIME = PART + 3
120    K = I + PRIME
130    WHILE K <= 8190
140      FLAGS(K) = 0
150      K = K + PRIME
160    WEND
170    COUNT = COUNT + 1
180  NEXT I
190 NEXT M
200 PRINT COUNT, "Primes"
210 END
    
```

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### BDOS

Func. #

### Table 3

Description

37	Reset drive.
40	Write random with zero fill.
46	Get disk free space.
47	Chain to program.
48	Flush buffers.
50	Direct BIOS call.
59	Program load.
61	Set exception vector.
62	Set supervisor state.
63	Get/set TPA limits.
80*	NOP—very little function at user level.
81*	EXIT—used in MC68000 program to exit CP/M-68K and return to Z-80 CP/M with a warm boot without giving up control under CP/M-68K.
82*	Pickles and Trout call.
83*	INP—Input value from a port.
84*	OUT—Output value to a port.
85*	MEMRD—Read byte of Z-80 memory.
86*	MEMWR—Write byte of Z-80 memory.

\* Trisoft developed special functions.



---

# Tandy topics

Ed Juge, Director of Merchandising, Business Computer Products  
1500 One Tandy Center, Ft. Worth, TX 76102

Well, this is Tuesday, so I must be in Philadelphia! It's the third morning of our first annual regional meeting, and I'm between breakfast and our third face-to-face store manager meeting. Since I'm trying to give you some flavor of Tandy operations, I'll tell you a little about these meetings.

It's quite a feat getting the Fort Worth staff members in personal touch with 4,600-plus individual store managers once a year. It would be impossible without these meetings. The feedback (from you to them to us) is absolutely essential if we are to meet the needs of our marketplaces (and not just computers). As I've told you in past columns, this is the time when we show our people the new fiscal year's product line, answer their questions, listen to their needs and reward the stellar performers among them. It's hectic, but fun and rewarding for all. As tired as we Fort Worth folks know we'll be by Labor Day, there's not a one of us who would give it up if we could.

## The Agenda

I flew in Saturday afternoon to take part in the Sunday meetings which are just for Computer Center and department managers. After breakfast, they're welcomed by their divisional vice president, and there's a film on the theme of the year's meetings. This one covers everything from how Radio Shack

got its name, to where we are in the high technology markets today. Next, there are presentations on a number of elements of computer-specific operations and products. Then the managers (200 or so) are split into two groups and each group has three afternoon sessions with different members of the computer buying staff.

Monday morning, those same people, plus our regular store managers, assemble (about 1,000 total) to hear presentations from our executive team on everything from where we've been and where we're going, to company benefits, to the 1984 consumer and computer product lines. Monday afternoon and Tuesday are smaller, face-to-face meetings, with presentations by our individual buyers and executive groups, and question-and-answer sessions. Monday evening there's an awards banquet where outstanding performers are recognized by their peers and by management.

This same scene will be repeated in the coming four weeks in Chicago, San Francisco, Washington, D.C. and New Orleans. The major presentations will also be repeated in Fort Worth for those folks at the home office who didn't go on any of the out-of-town trips. I'll repeat the computer products presentation still once more for our international franchise meeting. As you can see,

there is a lot going on this time of year. So, if my column this month doesn't flow very well, please forgive me. It's probably going to be written in a number of spurts, in a lot of different places.

## Computer Merchandising's "New Look"

I told you last month that Jon Shirley was leaving Radio Shack for Microsoft. At that time, no announcement had been made about his replacement or, I should say, replacements. Jon's leaving gave management a chance to do a bit of reorganizing to better address our rapidly expanding computer operations. Computer merchandising is now split into three sections. Bill Wash, who formerly ran computer customer services, is now Director of Computer Merchandising Services which includes customer services, our newsletter staff, computer center training, software quality assurance and outside software support. Mark Yamagata, who has been our merchandising manager in the United Kingdom, has returned to take the new post of Director of Merchandising, Personal Computer Products. He will be responsible for Color Computers, Models I/III/4, Pockets, and the Model 100. I will occupy the other new position of Director of Merchandising, Business Computer Products. I'll have the II/12/16, printers,  
October, 1983 77



## Tandy topics

peripherals, and software product planners. Of course, both Mark and I have some future products pending, as yet unannounced.

It's a good split and should allow a more concentrated effort than ever before to be directed toward all products.

### Questions

Several questions have been raised, and things announced at our meeting, that I think might be of interest, so here goes . . .

Can we get green screens on a Model 4? Yes, there is a conversion available through the repair centers. It's not cheap, but it's available. Will we ever do it as a production change? Anything is possible. The price "hickey" for green is about gone now, so it's possible but don't expect it any time soon. There are decisions to be made and then those lo . . . ng lead times.

Will an "older" Color Computer run OS-9 and work in 64K mode? Any unit can be converted, but we've

been producing Color Computers with 64K of memory since about the first of this year. If yours has an A or B suffix behind the catalog number, it's 64K-capable. If it was originally, or has been converted to, a 32K, it probably contains 64K chips. If so, all you need is a disk drive and OS-9. If in doubt, have your local Radio Shack check it out for you. Be advised, however, OS-9 is not for the faint-hearted or the beginner! Our buyer likes to describe it as a "mini-Xenix," multi-tasking, multi-user operating system. The documentation is neither hand-holding nor tutorial.

### CP/M Compatibility?

Radio Shack's CP/M . . . what can you really do with it? Well, since IBM entered the 8-inch disk arena long ago, they pretty well set the formatting standards for the industry. You should be able (with an 8-inch disk) to boot with our CP/M, remove it, and load almost any 8-inch disk application running under CP/M 2.0 (or later versions), and run or copy your application onto your Radio Shack disk. (Don't make me promise all this, since we don't have the final versions in hand yet.)

If you have a Model 4 (sorry, it won't fly on Model III), the story is a little different. Big Blue didn't do us the same favor with 5-inch drives, so there are lots of standards floating around. Our plan is to support single-density in the format used by Osborne and Kaypro, and double-density in IBM PC format. Again, the final version is not yet in hand.

The Model 100 produced a couple of common questions: Bar code wand? We hope to have it in October, at \$99.95, with the drivers for UPC, NATI and three of nine formats. For now, you'll have to supply the actual applications program to do what you want done. A second Model 100 question is about ROM calls. Our national account representatives and customer services currently have a multi-page list of information we think Model 100 owners will want. The plan is to send a letter to all Model 100 owners of record and tell them to ask their store to get it for them. No charge! Uh . . . is *your* Model 100 registered? Did you return your newsletter card?

That brings up a good question. How do we register you as an owner? Well, on hardware, we pick some of the information up from sales tickets — when it's legible (and all of it isn't). You can help by returning the card packed with your CPU (smaller PC's don't contain the offer) which entitles you to six free newsletter issues. That's the one thing *you* submit which gets you on the hardware owners' list. With each disk, non-game software package, you get a software registration card. That's the way you get on the software list. And, for the umti-umph time, neither of those cards have anything whatsoever to do with your warranty! Don't hold them until you need service, thinking your warranty clock starts ticking then. Your warranty is based exclusively on your sales ticket showing when and from which store you bought. Those cards, presented to a repair facility, won't even get you a cup of coffee *with* your 50 cents.

One of the neat products we sprung on our managers is a \$6999 Model 16 with 256K RAM, and a 15MB hard disk built in! Boy, did they love it. To supplement it, there's a three-user plug-in card, which allows the 16 to support a full six users, for only \$299.


### What's a Printer Controller?

For the less affluent, there is a new PTC-64 Printer Controller. Whazzat? Well, it's an intelligent printer buffer. It contains 64K of memory and allows your computer to dump information to be printed, then go on to bigger and better things, while the buffer spits out bytes at the speed your printer can handle. From program or keyboard, you can program the PTC-64 to print one to 100 copies of your document. A pause switch is available which won't miss a character. It contains 16 scientific characters which are definable by the user and can be printed by a dot-matrix printer in graphics mode. It contains a Z-80 CPU and is a super accessory for \$249.95.

Without giving away all of our secrets (and so you'll still have a reason to visit your nearest store), I think I'll stop here. See you next month.

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# Reviews

**User's Handbook to the TRS-80 Model II Computer**  
**Jeffrey R. Weber**  
 Weber Systems, Inc.  
 ISBN 0-938862-01-4  
 \$13.95 paperback, 300 pages

Mr. Weber has compiled almost all the information you would need to be conversant with your Model II. He starts with an introduction to the world of TRS-80. He follows this with a chapter on installation, operation and maintenance. Then there is an introduction to TRSDOS, the TRSDOS Library commands, TRSDOS Utility programs, introduction to Model II BASIC and a Model II reference guide.

Appendices include the Model II ASCII codes, TRSDOS error codes and messages, BASIC error messages, BASIC reserved words and internal codes for BASIC keywords.

If all this sounds familiar to Model II users, it is because it is virtually the same information contained in the Model II owner's manual, which is free when you purchase your machine.

It may be a little handier to use due to its 5x8-inch size, but other than that, I would stick with the one that came free with the machine, primarily because that way you get updates and corrections.

I. Mike Schmidt

**TRSDOS 6.0 Enhancements**  
 Micro-Systems Software, Inc.  
 4301-18 Oak Circle, Boca Raton, FL 33431, (800) 327-8724  
 Model 4 only: \$49.95

Model 4 TRSDOS lacks many features that make the programmer's job easier. What Tandy left out, Micro-Systems Software's 6.0 PLUS has added, with enhancements to Model 4 TRSDOS and BASIC that raise the DOS a step beyond anything previously available. My question is, "Why did Tandy choose to leave out these features?" It is especially puzzling when you consider that NEWDOS/80, which includes most of the features in the enhancement package, took first place in a recent

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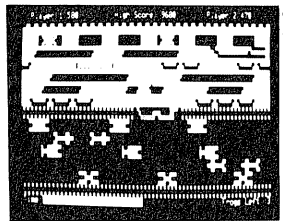
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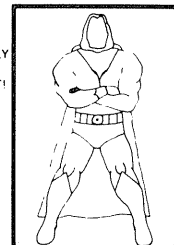
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## Reviews

popularity survey. So much for editorializing — let's look at the enhancements.

For starters, there are now two "zap" programs called DISKZAP and DISKDUMP. Both are fast machine-language utilities that allow the user to display and edit hex and ASCII data using a full-screen editor similar to Apparat's SUPERZAP utility. DISKZAP is a track- and sector-oriented editor that can also format individual tracks, copy selected sectors, verify sectors, fill sectors with a specified byte, and print hardcopy of selected disk sectors.

DISKDUMP is a file-oriented editor that allows display and modification of a specified file. The modified data can be permanently written back to the disk in either program. These utilities are almost a necessity for any serious software development.

The disk directory is a vital part of the disk. DIRCHECK provides a method to check the integrity of the directory and to repair certain types of damage to the directory. The program does not provide as much information as Apparat's excellent directory check utility, but this one is faster and will repair GAT and HIT errors. The error list can be directed

to the display, the printer, or to a disk file. Another very useful utility, called MAP, provides a list by cylinder and sector (starting and ending), of all files on the disk. The map has the option to display system and invisible files, or provide cylinder and sector numbers in hexadecimal. The format of the map display is: MAILLIST 001,006—001,011.

How many times have you accidentally killed a disk file, only to discover that it was your only existing copy? Actually, the directory information is not erased unless a new file was written over the old file's directory slot. It is simply flagged, indicating an inactive file. The utility called RESTORE will revive any file that was REMOVED unless a new file has replaced it in the directory. It will never bring back a killed file at the expense of an active one. These utilities form the DOS enhancements. Now, let's talk about the BASIC enhancements.

There are two general enhancement packages that can be permanently included in the BASIC interpreter. They are similar, the only difference being one extra command and the difference in memory overhead. The user can decide whether the extra 200 bytes are worth it or not. The extra command is the

INPUT@ command, which allows a controlled screen input statement. The syntax is: INPUT@<position>, "prompt," field length, item type (alpha or numeric); variable\$ (must be a string even if input was limited to numeric data). The prompt will print at the screen position either 0-1919 or "row,column," and print a string of underline characters the length specified in the field length parameter. It is quite attractive, very useful, and certainly worth the extra memory.

The most handy enhancements are the shorthand commands which are divided into two categories: immediate commands and abbreviated statements. The immediate commands are all list and edit functions: period to list current line, comma to edit current line, uparrow to list preceding line, downarrow to list next line, shift uparrow (or semicolon) to list first line, and shift downarrow (or slash mark) to list last line.

The abbreviated statements are: (A)uto, (D)elete, (E)dit, (G)oto, (I)nput, (K)ill, (L)ist, (L")oad, (N)ame, (R)un, (S)ave, and paren ( for SYSTEM. These statements can even appear in a program line and they will automatically be expanded to their normal state. They cannot be used if JCL is active or the

3 NEW utility programs that will be HELPFul to you.

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"protected program" option is in use. "DI" causes a program line to be deleted from its original position to a new location in the program. "DU" duplicates a line without altering the original. "DR" performs the same function as "DI" but will alter all references to the line to reflect its new position.

There is an excellent cross-reference utility, called REF, that builds and displays a cross-reference table of either a single variable, a single linenum, a single keyword, all variables, all linenumbers, or all keywords. Output can also be directed to a printer. This is one of the finest utilities of its kind that I've come across.

The next feature is called "SR" and it is a global search and replace editor. It will search a specified range of linenumbers for a specific ASCII string, display it and, optionally, replace it with another string at all occurrences. This is really handy for changing all PRINT statements to LPRINT.

No BASIC enhancement package would be complete without a good high-speed sort utility. 6.0 PLUS has an excellent array sorter that is upward compatible with the CMD"O" array sort in Model III Disk BASIC, but much more

powerful. You may sort up to 10 key arrays and up to 20 "tag" arrays for a total of up to 30 arrays. The sorts may be any combination of ascending or descending sorts. A simple benchmark was performed by sorting 5000 integers in a single dimension array with a total elapsed time of 45 seconds.

The last set of functions are perhaps the most powerful and handy features in the package. Label addressing allows branching to labels instead of linenumbers. For example, instead of GOSUB 1000, we could use GOSUB ADD after naming the subroutine ADD in our program. The next enhancement is expanded error messages, which prints the error message on the screen along with the offending statement. An arrow identifies the statement with the error.

The next enhancement adds two new keywords: "OPTION S" allows "short form" BASIC, which is compatible with Model III BASIC. "OPTION L" returns you to standard Model 4 BASIC. If you load a Model III program in under the "OPTION S", the computer will automatically uncompress the program by adding spaces around all the keywords. After the program is loaded, you may then reset it to "OPTION L." This allows you to convert Model III

programs to Model 4 format with a minimum of time and hassle.

6.0 PLUS takes TRSDOS 6.0 to new heights of utility and versatility. It may very well become the de facto standard utility package for TRSDOS 6.0, at least until the competition catches up.

**Jim Klapproth**

**Power**

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## Reviews

the use and syntax for each command. The information is redundant, but this repetition makes each section complete by itself and saves page flipping. Two document files on the distribution disk contain supplementary updates on improvements and describe two additional commands. The manual still refers to the old name of CPMPOWER, although the program has been renamed to POWER.

CP/M wildcard conventions and syntax are used, some CP/M function names are retained and CP/M terminology is employed making POWER easy to learn. All functions work with CP/M 2.0 or later. Most run on CP/M 1.4.

One of the nicest features of POWER is automatic repeat of functions such as Copy, Erase, Type and Rename. Copy is a special blessing as it is much faster than its CP/M counterpart, PIP. Your files are numbered by POWER and set up as a menu. You avoid filename typing errors when putting files in a queue for sequential processing by typing only the assigned numbers.

Routines are well written and error trapped. Bells and whistles include: choice of semicolon or colon for drive selection to avoid shifting, optional two asterisks in place of \*.\* for wildcard functions, selection of range of file numbers with dash (4-7, or 4- for all files to highest number), optional prompt before processing each file in a list, question mark entry for help screen list of commands (no explanations though), choice of BAK file, overwrite or skip where filename already exists, setting number of columns for disk directory display, and acceptance of either numbers or letters for disk drive identification.

Reclaim, the "unerase" function, goes through all of the previously deleted files and gives you the ability to reinstate them in the directory — great when you inadvertently erase the wrong version of a program! The manual neglects to mention that the revived files are given "read only" status which you can change with the Set command.

With Test, you can shunt all bad disk blocks to a limbo file eliminating BDOS errors which would occur with their use in a program. SETDIR and SETSYS turn directory display on or off for a file. On word processing disks, removing non-text files from the directory display makes it easier to find the file you want to edit.

To determine if a file is an exact copy of another, Check computes a checksum for each file for comparison. Speed gives you control over the pace of file scrolling with 10 discrete settings. You can slow down a part of the file to reading speed for

review, rapidly scan following sections, then reduce speed again for other data you want to peruse in detail. The spacebar stops scrolling and you change display speed by typing a number as the file lists. With User, you can partition your disk into 32 areas rather than the 16 offered by CP/M and can copy files from one User area to another.

Most of the commands I haven't mentioned operate in the same manner and with the same syntax as their CP/M counterparts. For assembly language programmers, the cherry on the sundae is a multifaceted POWER-ful monitor, similar to DDT in operation, but easier to use with added and extended functions.

The new CM (compare) command, documented in the disk update, enables you to match two assembly language programs in memory and provides a list of those bytes that differ. DS (display-substitute) displays each memory address in hex and decimal and you can alter approximately 120 bytes forward or backward from your entry point in hex, ASCII, binary or decimal. It is a snap to get a complete hex and decimal listing of an assembled routine to POKE into a BASIC program. Using Search, any ASCII, hex or combination of ASCII and hex characters can be found, with wildcard functions implemented anywhere in memory. Addresses containing matching bytes are listed. This is very useful in finding specific instructions or addresses in assembly programs.

Other assembly language tools include routines for reading or writing to or from any track and sector on disk to any memory location, reading or writing a group of sectors, reading out the group of sectors in a file, filling a block of memory with a hex character, loading a program and executing at any memory location, creating a duplicate block of memory at any higher or lower memory location, dumping a block of memory in hex, ASCII or both. Four User# calls are provided so that you can add a few of your own utilities. A nice, classy touch.

To avoid disasters from inadvertent use of memory-altering commands, you are provided with command table information and instructions to turn off any command as well as other customization data.

Perhaps what makes POWER such an outstanding value is that you will use this program literally all of the time. Pavel Breder, who authored the utilities, deserves a real pat on the back for this software. Try it. You'll like it!

**Charles R. Perelman**

*This review was based upon POWER, version 2.56, and Computing! has added many new commands and enhancements to their package. POWER, version*



3.03, allows a sorted directory, password enable and disable, and drive resets. Numerous command default options can now be set by the user. The directory denotes if a file is original or a copy, and the COPY command allows for renaming a file. POWER is currently available in an 8-inch format only. Users with 5 1/4-inch drives should inquire prior to ordering.

An extremely user-oriented version of POWER, called MENUPOWER, includes many of the most popular commands of POWER and has other features that make it easy to use. This version sells for \$149.

**Lynn Video Instruction Series**  
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This is my first movie review. No Oscars to be given out, just a nice round of applause. Lynn Computer Service offers numerous training tapes for computer users. I selected their Profile III+ tape for review only because I

already knew how to run the program. At least I thought I did.

The tape arrived in fine condition, in a plastic case and with some simple instruction sheets that were to be used for data entry as I went along. With a Model III at my side and the video player ready to go, I was all set. The instructions assume nothing on your part. It began by telling me how to load a diskette, enter the date and get started with Profile III+'s Creation Menu.

There are no actors in this movie -- just a very carefully developed script and pictures that show the actual video display as you do what the narrator says. In this case, the voice was pleasant (female) and easy to understand. Some of the scenes seemed to chop off the edge of what was on the video, but that may have been a misalignment in my own VCR and not a fault of the tape. The TV displays were large and easy to read.

I found the material to be carefully developed and quite appropriate. They carefully covered all options of the software and even gave some tips that are not in the Profile III+ manual. Much is covered, and more than one viewing is recommended. It does get boring, but a fast-forward button on the VCR will

quickly get you to the material that needs a second look. If the rest of their tapes are as well done (and I have no reason to believe otherwise), you can't go wrong. The price of \$39.95 makes their instruction tapes affordable to almost every office, school, or other computer installation.

Lynn Computer Service now offers instruction tapes for Profile III+, Model III TRDSOS 1.3, VisiCalc, Lazy Writer, SuperScript, DOSPLUS, Profile, NEWDOS/80 Version 2.0, MULTIDOS, LDOS, and three of their own business programs: Payroll, General Ledger, and Accounts Receivable.

I have some minor suggestions for improvement. It would have been helpful to have hard copies of the reports (or at least have shown them on the TV) so that I could compare my reports with those that they say I should have obtained. A simple script reference would be useful for those times that you wanted to go back to just a specific section of the tape.

This last suggestion is purely selfish. After listening to a voice for one and a half hours, I was curious whose it was. Ending the lesson with a human face would have been nice.

Cameron C. Brown

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# Reviews

## The Official Computer Hater's Handbook

D. J. Arneson

ISBN 0-440-56619-3

\$3.95 paperback, 192 pages

Dell Publishing Co., Inc.

We sometimes find ourselves so engrossed in computing that we tend to forget our sense of humor. D. J. Arneson, in his book just released by Dell Publishing, gets things back on track. You will chuckle, chortle and smile as you make your way through this tongue-in-cheek account of computers present and past.

Speaking of Babbage's Analytical Engine and the cards which followed it, Arneson says: "The cards weren't used as counters, as logic might suggest, however. Rather, holes in the cards were meant to stand for things. The insanity of it all should have been clear then, for to use nothing to stand for something makes as much sense as being able to annihilate something twice."

In reference to computer companies, "Serving you since March," Arneson says that the world is fast becoming run by computers, "a technology younger than last year's wine and just as volatile, designed by kids named Jeff and Steve

and Mark and Troy who couldn't produce a gray hair among them and who believe there's always been television."

My favorite chapter has to do with "The Valley Boys — Those Megamind Men and their Bitchin' Machines." Sample: "O.K., I mean, everybody's heard of the Valley. O.K.? Oh, fer sure, there's always some marvin back at Tucson Tech who's still into total research, if you know what I mean. Like Total dedication, O.K.? Without the bucks. That's why he's in Tucson. Only the real spazzes hang out there. But if you're really into chips, which is to say, bucks, then it's only slightly obvious the place to be's in the Valley. O.K.? I mean, these dudes are the max. Like brilliant, O.K.? It's mondo machine. Totally techno terrific."

All the way through this delightful book, Arneson makes you laugh whether you want to or not. It may be a little much to read in one sitting, and I would recommend a chapter per day. That way, you can chuckle for a whole week and a day.

I. Mike Schmidt

Howard Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, Ind. 46268 \$14.95


Those of us who provide management consulting services for agriculture are frequently faced with the question, "Should a farm purchase an on-farm computer system?" We generally attempt to answer, as we do other farm purchase decisions, from the point of view of cost-benefit analysis. If I were to apply those same principles to the question, "Should a farmer buy the book, *Microcomputers on the Farm*, my response would have to be "No. Certainly not at \$14.95."

The subject is right and Mr. Beasley's credentials seem impeccable, but it is a disappointing book in many ways. First, it is paperback, only 204 pages of large type and, page for page, not worth over \$5. It consists of one-third appendix material and a glossary that could have been gleaned from the Doanes publication *Agricultural Computing*, with less risk of obsolescence. The text is only one hundred sixteen pages long. Of that total, one-fourth is a rehash of a far superior Howard W. Sams publication by Louis Frenzel, *A Crash Course in Microcomputers*. By the way, I recommended that book unequivocally,

Microcomputers on the Farm  
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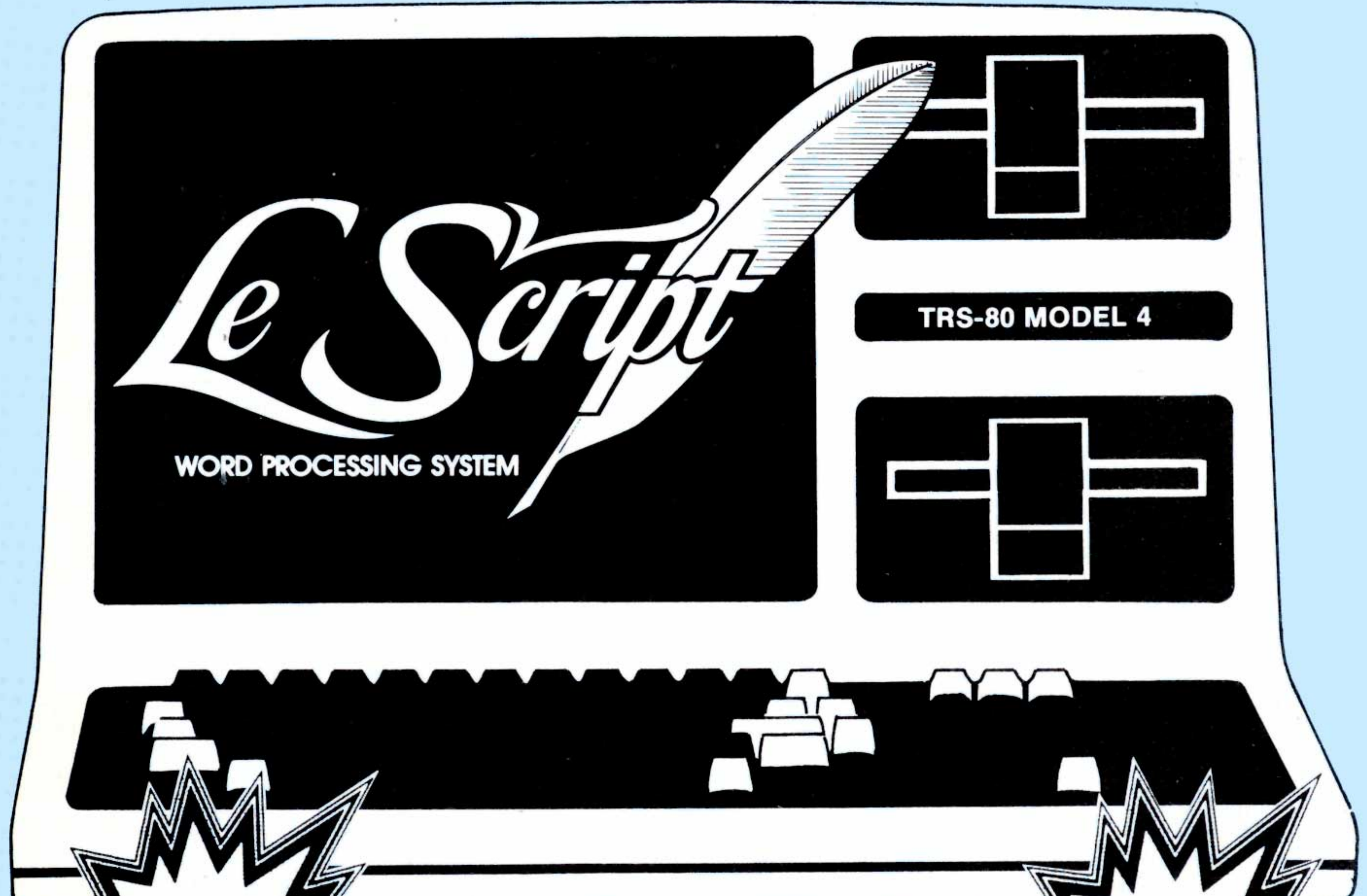
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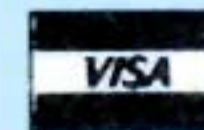
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## Reviews

in one of the columns we published recently.

Another approximately 30-plus pages consist of an editor's nightmare of poorly constructed sentences, awkward phrasing and list after list of reasons to buy, what to buy, and how to buy it. Now, I am a great fan of lists, as long as they summarize, accentuate or otherwise serve as topic titles for further detailed exposition. In this case, the lists are frequently left standing as bare as a medical school skeleton, without any muscle or sinew to fill them out. And they are probably as meaningful to a farmer as that set of bones would be to an anatomy class looking for a full-fledged cadaver.

The book needs better organization and more examples, anecdotes, case studies and comparisons. It is obviously not beyond the author since Chapter 7, "Financial Analysis by Model Building," is a model of clarity on the complex subject of spreadsheet applications. Quite frankly, it's almost as if someone else wrote that chapter.

Beasley's book would also benefit by language that is far lighter than the heavy-handed, redundant, academic style he uses. The topics of each chapter are tantalizing, but the content is either so generalized as to be useless, or so complex and detailed as to be incomprehensible.

Chapter 9, "Using Dial-up Services," has some real potential for the farmer and specific references to Agnet, Telplan and Facts are helpful, but the first seven pages explaining how data is transmitted is far too esoteric for an introductory book. Whereas Chapter 6, "Financial and Physical Record Keeping," is so general that payroll (the biggest problem in many southern and western farm states) isn't even mentioned. There are touches of humor throughout the book, but they are too few and far between.

I am a writer who has had more than his share of reject slips and my appraisal of organization, language and style might be taken as the jealous rantings of a hypercritical competitor. But my wife, the editor, carefully highlighted enough examples of wordiness and awkward syntax to turn Rudolf Flesch blue.

If this book weren't so important, because of its pioneer status, I would've dismissed it out of hand. The faults represent an excellent example of what the farmer had to put up with in the first renditions of so-called farm software. Clearly, they were getting standard business accounting systems gussied up with farm vocabulary. And it was almost worthless for most agricultural applications. But things have gotten a lot better, because qualified

programmers who knew farming, or qualified farmers who learned programming, moved into the marketplace. They did their research and spent the time and effort necessary to produce understandable documentation and useful programs.

I certainly hope the message is clear for all the publishers out there. We desperately need good books on vertical market microcomputer applications, particularly well-documented case studies with careful software analysis and system comparisons. Farmers will buy books on farm-related applications for their TRS-80, Apple, IBM PC, and other systems. And a good, brief, well-written introduction is very timely, but not this one at \$14.95.

What farmers don't need is something thrown together from ten or twelve other sources, that is massaged and rewritten with a farm label put on it. The marketplace deserves better than that.

### Dick and Jan Landis

*The reviewer is a consultant with Agri-management, Inc. in Yakima, WA. Prior to working in the computer industry, Mr. Landis was a management consultant for Arthur Young & Co. He has written articles for Desktop Computing, Personal Computing, Basic Computing, ISO World, Computer Dealer, Produce News, Washington Cattleman, Western Fruit Grower, Central Washington Rancher, and AcreAge. He and his wife, Jan, also write a monthly column, "Computers Afield," for five regional farm publications. You may write to him at 1003 Goodlander Cir., Selah, WA 98942.*

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Color Computer games break down into roughly three categories: adventure, which has a dedicated following and a fairly low number of high-quality commercial offerings; original arcade-style games (which you can count on your hand), and arcade clones which range in quality from simply awful to absolutely first-rate. Datasoft has added a new category to TRS-80 Color Computer gaming. It is the *authorized* Color Computer version of the popular arcade game.

The first thing that you notice about Datasoft's Official Zaxxon is the fact that the total package is a class act. The exterior art work, interior documentation and total presentation is high-quality,

multicolored and absolutely professional. When you are visually bombarded with excellence, you naturally expect the same excellence from the program inside.

They don't let you down. Zaxxon, as a commercial arcade game, was a complex graphics offering featuring the best three-dimensional graphics available. Zaxxon as a TRS-80 Color Computer game follows that arcade excellence right down to the last brick in the wall.

The game follows a traditional shoot-em-up scenario with a twist. True depth of field graphics, complete with shadows, gives the illusion of a three-dimensional display. The walls, gates and exploding fuel tanks all give the player targets worthy of his attention. The force screen, anti-ship rockets, and turrets all provide protection to a totally interactive display that will quickly convince you that you are attacking a heavily-armed island in space.

True to the arcade Zaxxon, the Color Computer version has that lonely, deep space, battle-off-the-end-of-the-platform feel. Here, the depth of field illusion is even more pronounced. The combat is superb. The relief at getting back to the battle island is short-lived. There are subtle changes in the second rack which add to the difficulty.

Even old Zaxxon himself, if you are skilled enough to get that far, is like the coin-op. This astonishing graphics presentation never lets you down. There is always something to keep you busy. You'll find yourself reaching for quarters. It's that realistic.

On a well-aligned monitor or color television, this game gives an explosion of colors that are well blended to enhance the action. The sound routines are not obnoxious as they are in some games. They reverberate and echo. They add to the arcade feeling and then fade away.

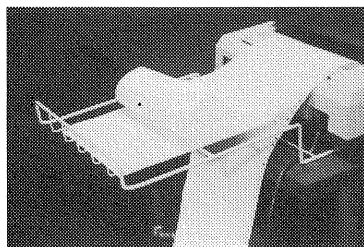
Datasoft is to be commended for creating a high-quality program. It is one of the few around that deserve the label "professional." If arcade action is your style, if you are up for a challenge, if you want to see your Color Computer do tricks that you did not believe possible, give this one a try. You should be able to buy Zaxxon at your local computer software store. If that doesn't work, call Computer Shack. That's where I got mine. They deliver fast and they don't fool around.

Zaxxon from Datasoft is, without a doubt, the best animation presentation I have ever seen for the Color Computer. It is a must for the library of any serious Color Computer user. As soon as I finish this review, I'm going to go back and see if I can beat it this time. I'm saving a fortune in quarters.

**Bob Liddil**



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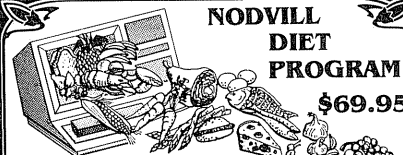
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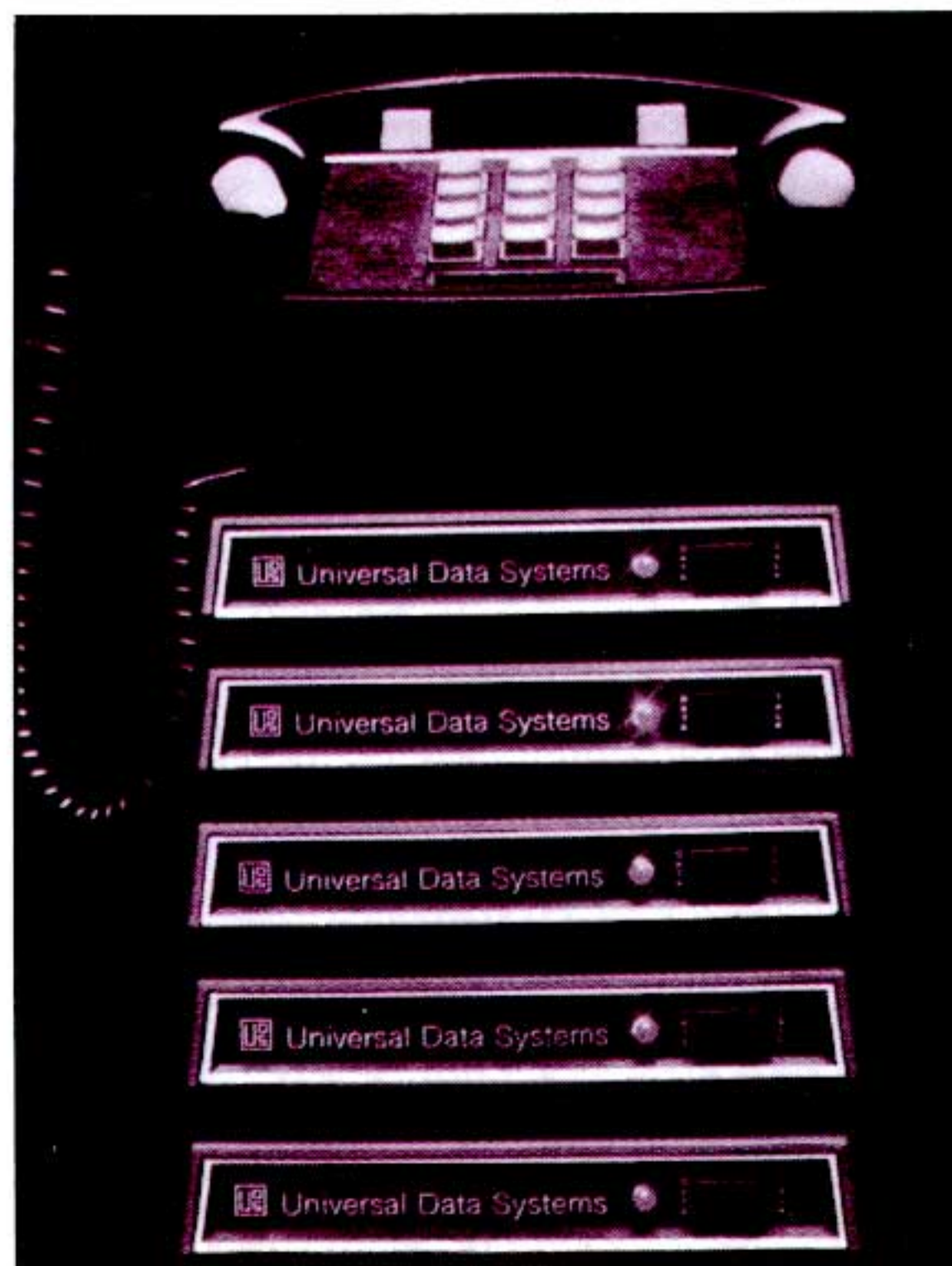
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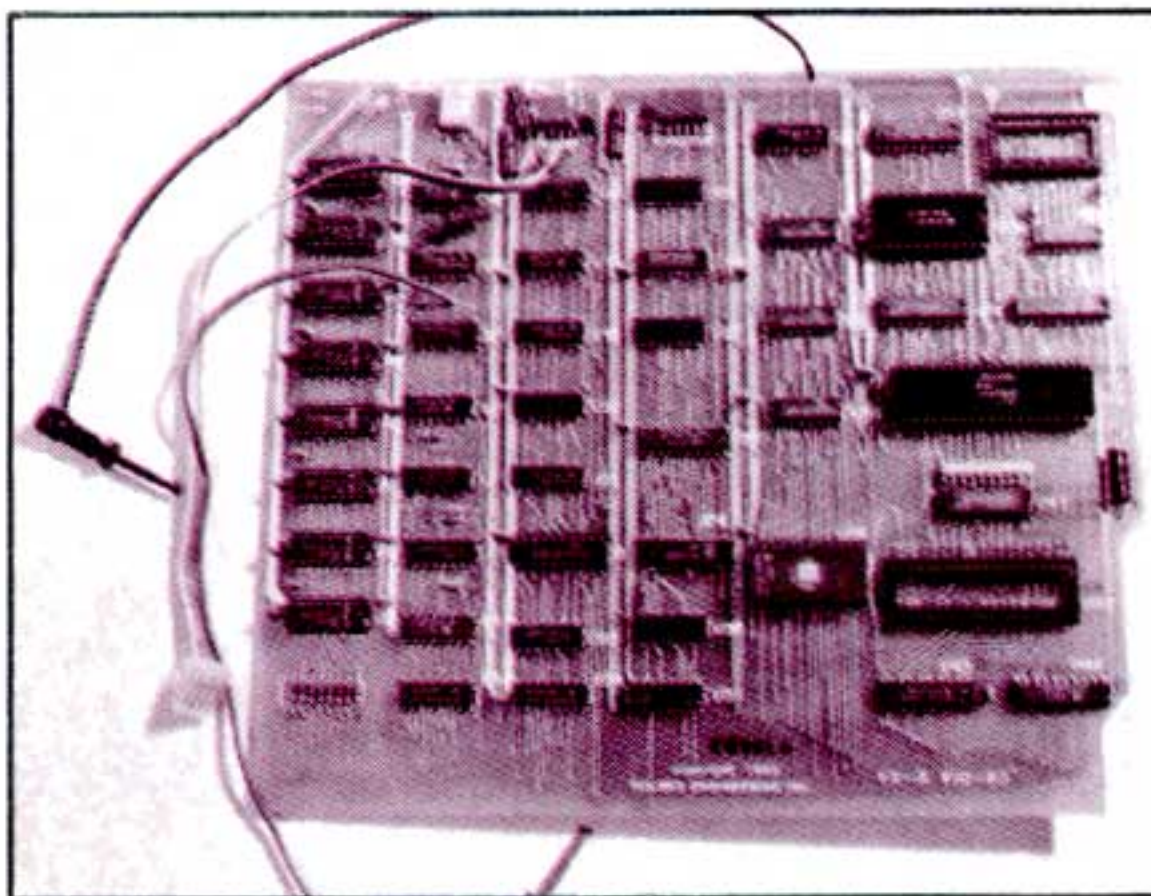
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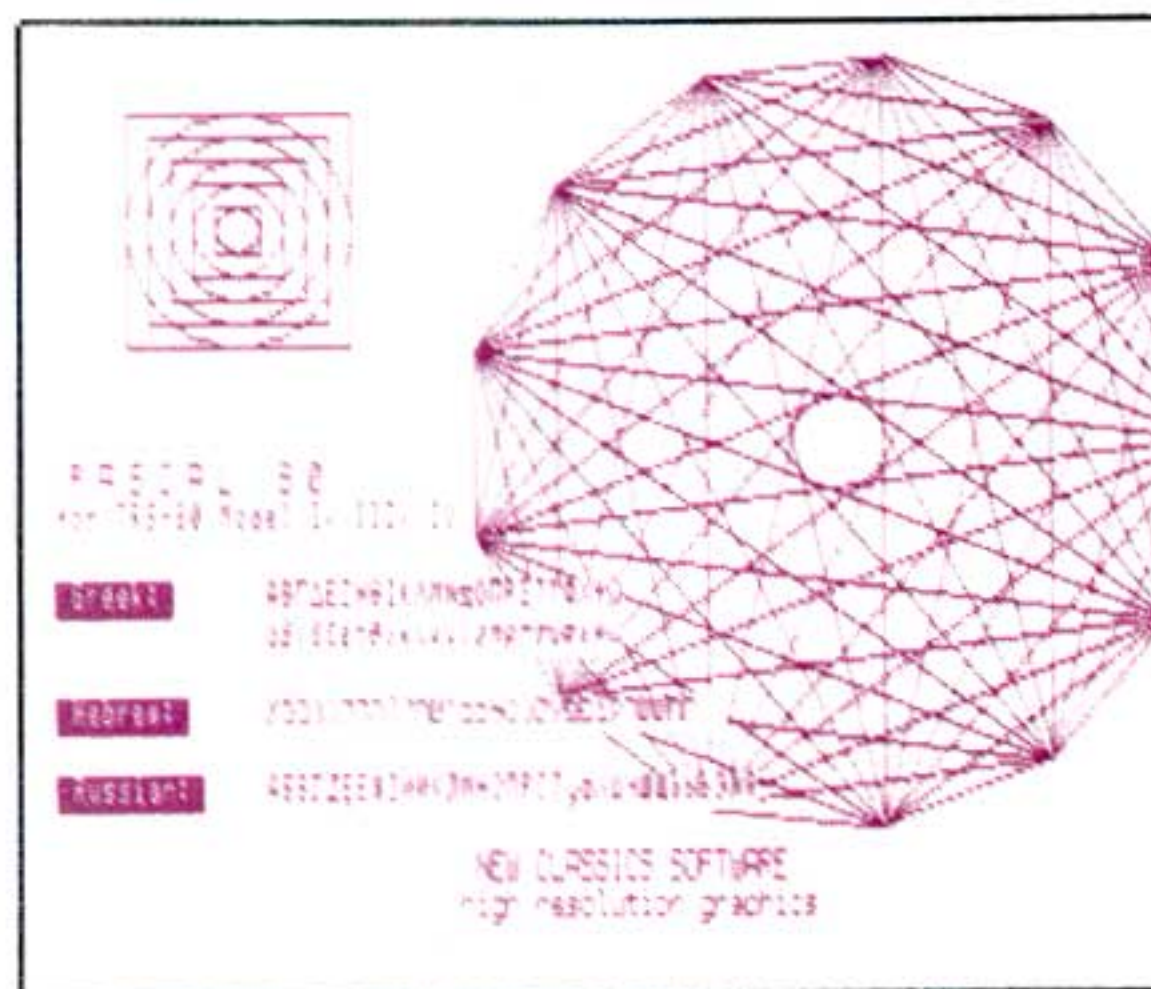
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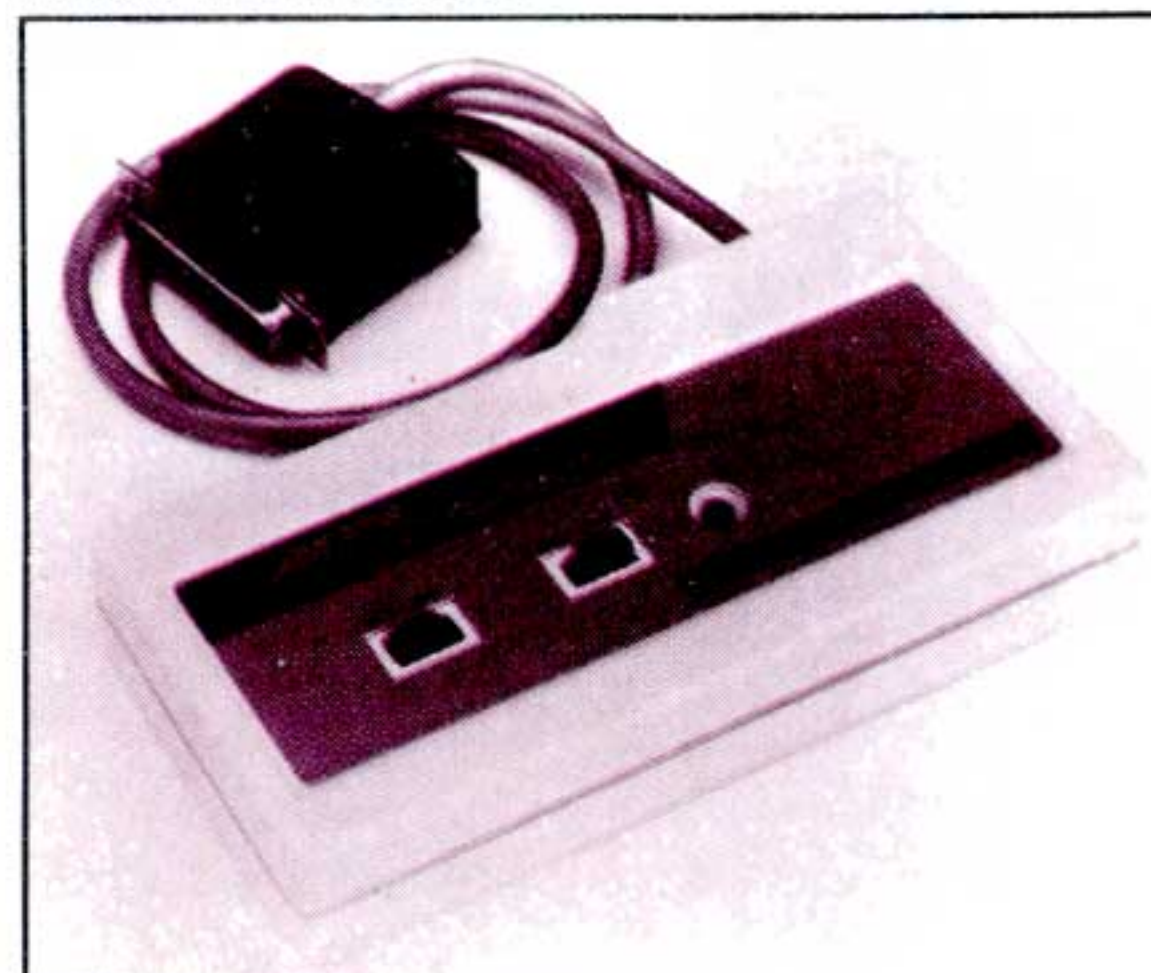
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Two new joysticks from Comrex provide precision control, quick response, and ease of operation for video game systems. The CR-401 ComMander (on the left in the photo) is Color Computer compatible, uses a single gimbal to activate dual 100K potentiometers, one in each axis. It includes trimmable X and Y axis fine tuning, snap-action microswitch buttons, and a coiled cord that prevents wire tangling. Contact Comrex, 3701 Skypark Drive, Torrance, CA 90505 (213) 373-0280.

### Androbot's Topo

Topo is a walking, talking personal robot that entertains and educates. Your home computer acts as his brains and memory and is interfaced via a remote infrared communications link. His text-to-speech and movement capabilities can be keyboard or joystick controlled. Androbot is supplied with a software package based on the Forth language. Topo retails for \$795, is about three feet high, weighs 33 pounds, and moves at about two feet per second. Look for it in many computer stores around November. The company is planning to release TRS-80 versions of the software and interested readers should write for more information. Consumer Affairs Dept., Androbot Inc., 101 E. Daggett Dr., San Jose, CA 95134.

### Radio Downloading

Microperipheral Corp. has a new receive-only modem which is designed for reception of computer data from commercial radio stations. The modem costs only \$69.88 and works at 4800 baud as well as Bell 103 (300 baud). One cable plugs into the audio-output jack of the radio and another, terminated in a DB-25 connector,

plugs into the serial port of the computer. Power is supplied by a common 9V transistor radio battery. Users record data off the radio and play the tape into the modem, or they may feed directly into the computer from the radio. The system eliminates the need for telephone lines and mainframe host computers. For information contact Michael Darland, The Microperipheral Corporation, 2565 152nd Ave. N.E., Redmond, WA 98052 or call (206) 881-7544.

### Pascal 80 Graphics

New Classics Software has a high resolution graphics package for Pascal 80 that allows Model III/4 owners to use Pascal for their graphics programs. The package sells for \$39.95, requires Pascal 80 and the Radio Shack high resolution graphics board. Included are Pascal turtle graphics, a character generator, printer routines and demonstration programs. Contact New Classics Software, 239 Fox Hill Road, Denville, NJ 07834 (201) 625-8838.

### Byte Bat

Have you ever felt frustrated when a computer didn't do what you wanted? The Byte Bat, which sells for \$9.95, is a 17 inch foam rubber baseball bat that gives you a harmless way to strike back. The device is compatible with all computers and operating systems, making it the first universally-compatible foamware. Contact MicroTie Systems Corporation, P.O. Box 8112, Walnut Creek, CA 94546 (800) 227-3900. In California call (800) 632-2122.

### Holmes VID-80

The VID-80 is a plug-in printed circuit board that expands the Model III display to 80 characters by 24 lines and allows operation of CP/M 2.2. Most Model III operating systems such as TRSDOS, DOSPLUS, LDOS, NEWDOS/80 will also run in the expanded display mode. CP/M 2.2 has been enhanced to allow eight inch drive capability (if your system includes a disk controller such as the Holmes DX-3D) and the VID-80 is compatible with it as well as many different 5 1/4 inch disk formats. The VID-80



will run standard Model III software in its normal 64 by 16 mode, provides 56K user memory, and can read and write numerous disk formats including IBM PC, Kaypro II, XEROX 820, Osborne-I and others. The VID-80 board retails for \$279 and the CP/M 2.2 operating system sells for \$120. Additional memory and CP/M 3.0 are also available. Contact Holmes Engineering, Inc., 5175 Green Pine Dr., Murray, UT 84107 or call (801) 261-5652.

#### Model 4 Memory Upgrade

RAMPAK, a Model 4 RAM upgrade, is available in two versions. The RAMPAK-I sells for \$96 and is for 16K to 64K upgrades. The RAMPAK-II sells for \$110 and is for 64K to 128K expansion. RAMPAK-PAL, a programmed array logic chip is available separately for \$34.95 for those who wish to upgrade from 64K to 128K using their own 64K RAM chips. Contact VR Data Industries, Inc., 777 Henderson Blvd., Folcroft, PA 19032.

#### The Analyst

Modular Software Associates offers The Analyst, a utility to help speed up Disk BASIC programs. It analyzes a BASIC program while it runs. After displaying the results, you can quickly add a DIM statement to speed up the program, by as much as 50 percent. The DIM statement arranges the program's variables in descending order of frequency and this enables BASIC to find the frequently used variables quickly. It works on the Models I and III and comes on diskette for \$24.95 plus \$2.50 shipping. Contact Modular Software Associates, 209 18th Street, Huntington Beach, CA 92648 (714) 960-6668.

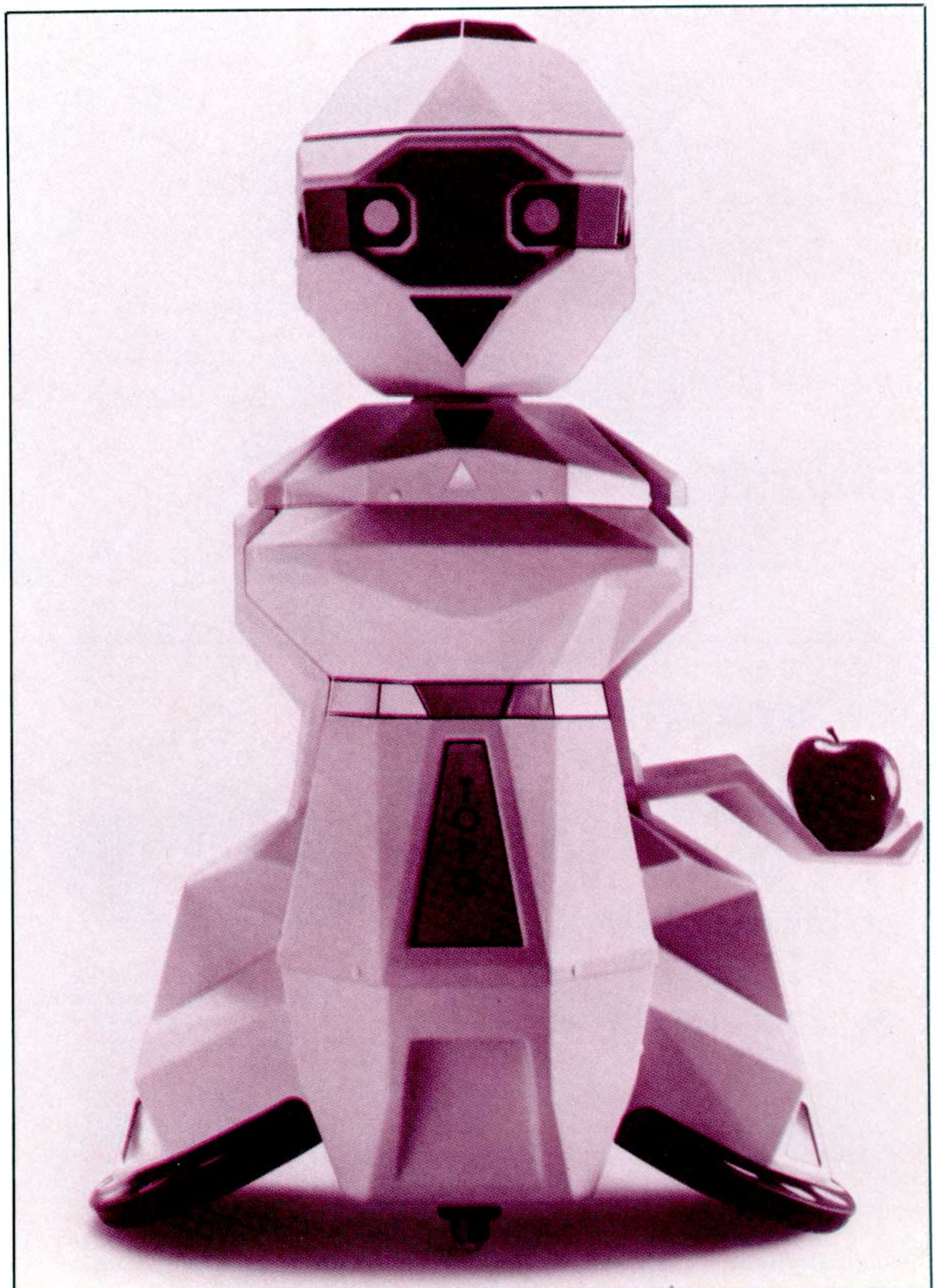
#### Model 100 RAM Module

The IM-100 is an 8K RAM memory module which plugs directly into the existing sockets of the Model 100. Up to three of them may be added to upgrade the Model 100 to a total of 32K RAM memory. It is priced at \$75 and only \$70 per module when purchasing two or more. Contact Holmes Engineering, Inc., 5175 Green Pine Drive, Murray, UT 84107 or call (801) 261-5652.

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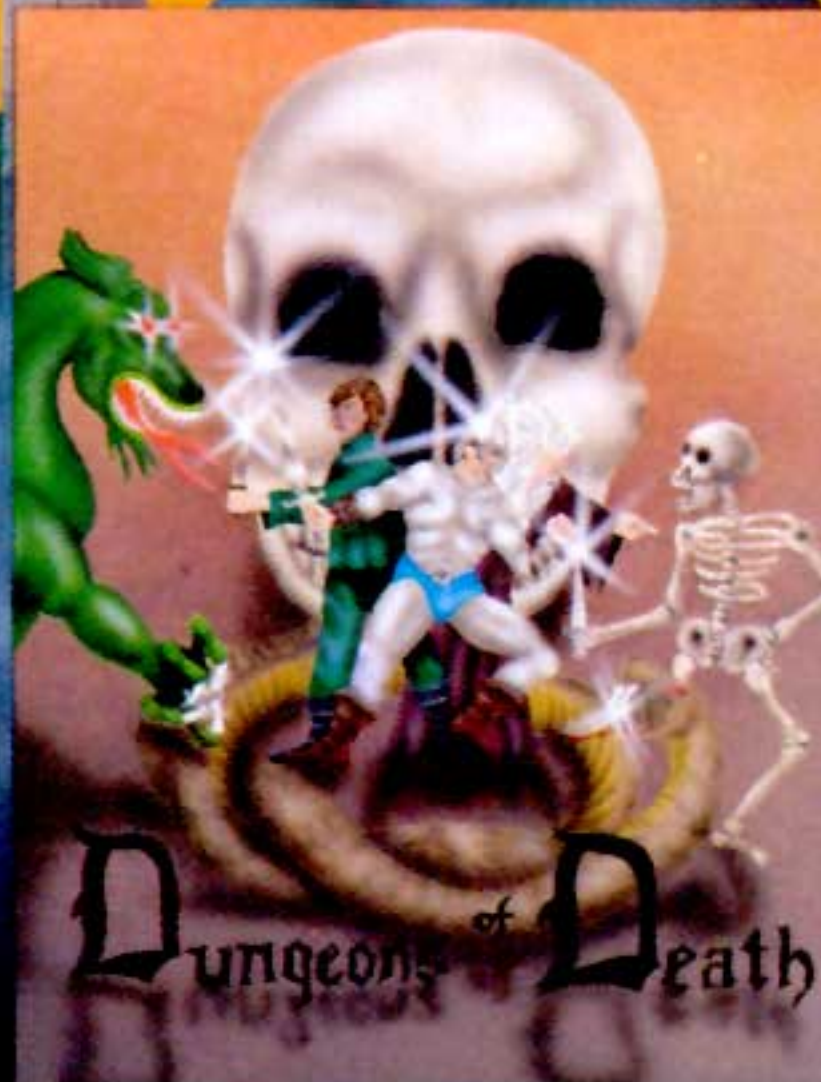
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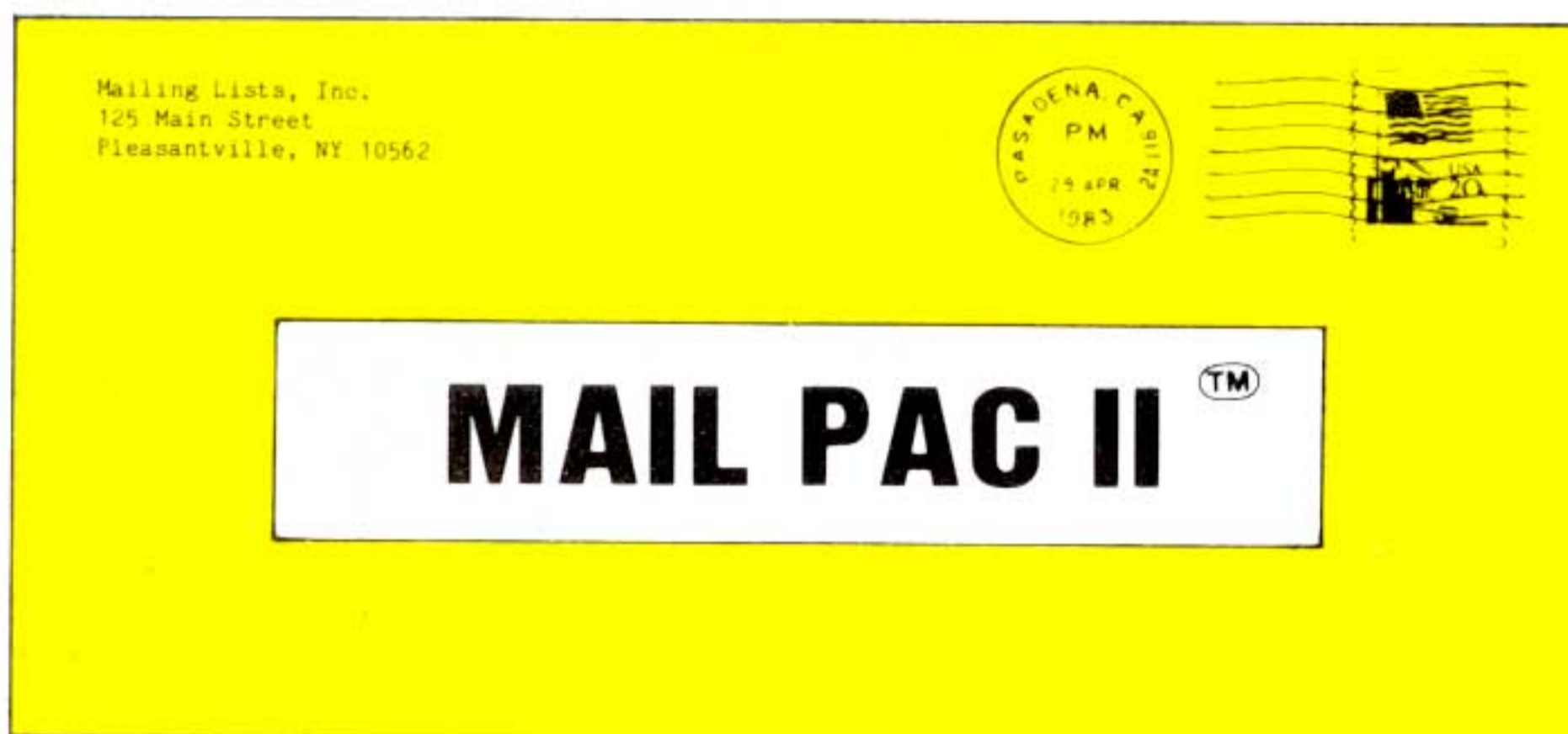
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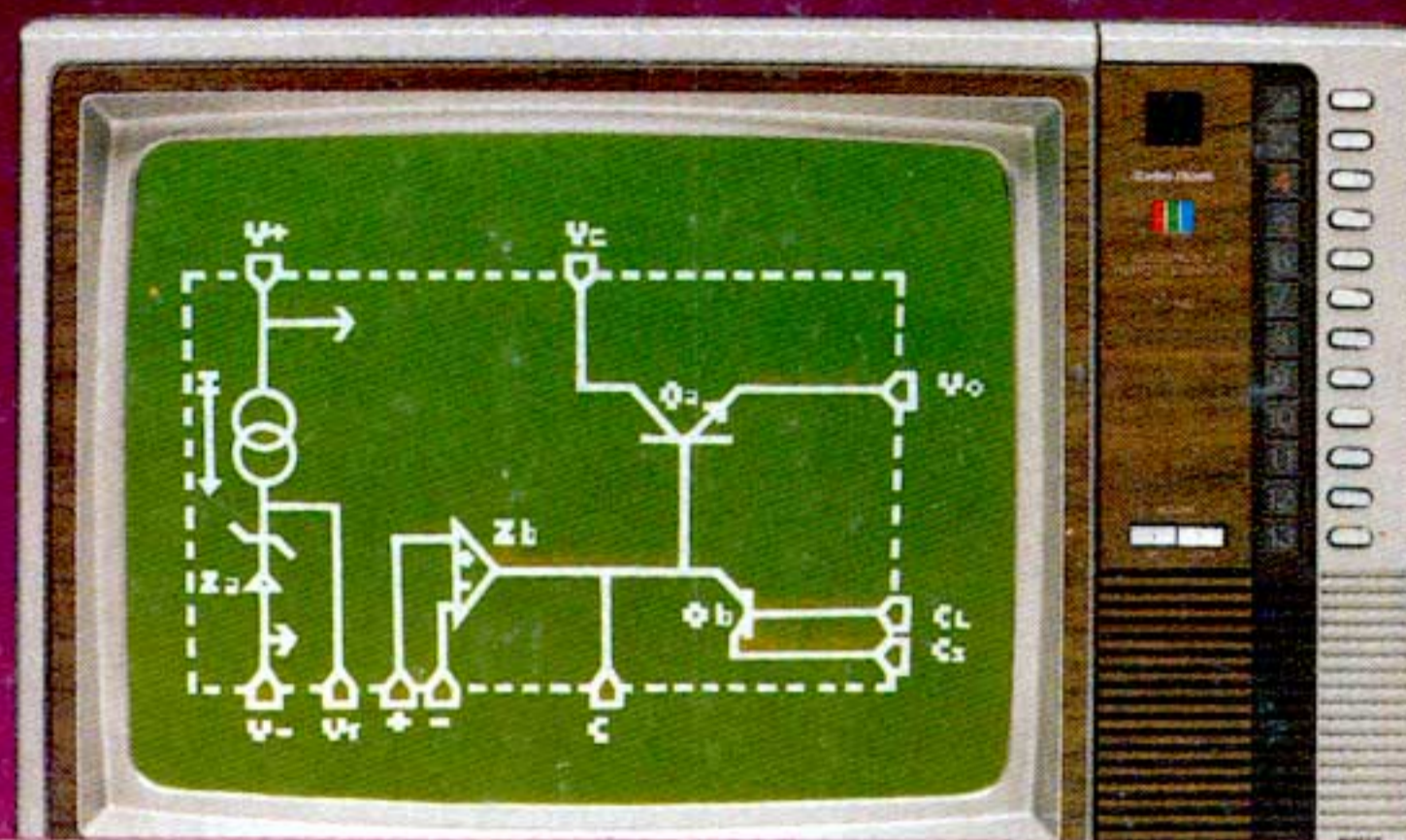


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